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## Studies on the chironomid midges of the Stream Itachigawa, Toyama\*

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### いたち川のエスリカに関する調査研究

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私共は1983年5月より1986年7月にかけて、富山市とその近郊を流れるいたち川と、その支流の松川に発生するエスリカ類の調査を行った。採集方法は(1)川岸の草むらなどに休止している成虫、および空中に群飛している成虫の捕虫網による捕集、(2)川の底泥、水草などエスリカ幼虫の生息していると思われる材料を採集し、研究室で水槽に移し、飼育して成虫を羽化させる方法、とでこの水系に繁殖しているエスリカ類を集め、主として雄成虫の形態からその種類を同定した。

その結果、Table 1 に示すように合計して51種類ものエスリカ科の生息が確かめられ、そのうち11種類は動物学上の新種と判定してそれに学名を新たに与えた。中でも第10図のシオタニ・トヤマエスリカ(塩谷・富山揺蚊) *Toyamayusurika shiotanii* と名づけたものは全世界の文献にも類例のない珍奇な形態を示すもので、故・塩谷敏幸富山市長の科学と文化へのご貢献を記念することとした。

これらエスリカ類の種類構成から次のような結論が導かれた。(1)いたち川のような富山平野と富山市内を流れるごくありふれた小さな川でも、よく調べてみると51種類ものエスリカ科が見出され、そのうち11は新種、さらに3種は日本未記録種であったということは、日本産エスリカ科の調査研究がこれまでいかに貧しかったかを示すと共に、富山平野の動物相がいかに豊富であるかを示す資料といえよう。(2)今回見出された既知種は、これまでの東京都の多摩川水系などのエスリカと共通種も多く、それらの分布から、いたち川の水質は「きれい」「ややきたない」「きたない」の3段階にまたがるものと判定された。

市街地を流れて、生の下水を受け入れているところでは「ややきたない」と「きたない」を示すエスリカ類が、その水質浄化に貢献をしていることが窺われた。

## INTRODUCTION

The insect family Chironomidae, or the non-biting midges, contain large numbers of species whose larvae are breeding in almost all types of inland waters, and the distribution of each species have been shown to be highly correlated with the physical and chemical qualities of the waters, as shown in the series of papers published by SASA and coworkers (1978-86). The present study has been conducted as a part of the ecological surveys of the Stream Itachigawa and its tributaries organized by Dr.S.NAGAI and his staff of the Toyama

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Science Museum. Collections of adults and larvae of the chironomid midges were conducted several times during the period from May 1983 to July 1986, and the numbers of each species identified mostly by the adult males were recorded for each collection site. As the results, a total of 51 species of the family Chironomidae were collected and identified, and their distribution in relation to the chemical, physical and biological qualities of the collection sites has been demonstrated. It was especially noteworthy that as many as 11 new species were recorded at the present surveys, and additional 3 species were judged as new records to Japan. Eight out of the 14 new or newly recorded species belonged to the tribe Metriocnemini of the subfamily Orthocladiinae. In addition, several species which have been previously recorded from Japan but whose morphology, biology or distribution has been only poorly known, were collected, sometimes in large numbers, and valuable information on the chironomid fauna of Japan was accumulated.

## PROCEDURES AND METHODS

### 1. Collection sites and date of surveys

The collections of adult or larval specimens from the Stream Itachigawa (Stations No. 1~No.10), and its tributary, the Stream Matsukawa (Stations A to J), were conducted by the following schedule.

- a. 24 May 1983 ; collection of adults and larval samples at B to G
- b. 29 August 1983 ; collection of bottom samples at A, No.6 and 7.
- c. 3 September 1983 ; collection of bottom samples at J.
- d. 5 November 1986 ; collection of adults and bottom samples along the entire length of the Stream Itachigawa from No.1 to No.10.
- e. 16 April 1986 ; same as in d.
- f. 6 July 1986 ; collection of adults at No.5.

### 2. Methods of collection and preservation

The adult specimens were collected, as a rule, on the bank of the river, either by sweeping the resting places (bushes or grasses) with insect net, by catching the adults swarming in the air, or by sucking the adults resting on walls or plates with an aspirator. They were then transferred to small plastic containers after anesthetised with chloroform and kept dry in a refrigerator until examined for species identification.

The samples containing chironomid larvae, such as bottom muds, stones and waterweeds in the rivers, were collected in polyethylene bags, brought to the laboratory, transferred into transparent plastic containers 30 cm in diameter and 15 cm high, to which water is added to a depth of about 8 cm, air bubbles were introduced through a plastic tube, covered with a nylon net fixed with elastic band. The adults emerged from the samples were collected every other days with a sucking tube. They were also preserved dry until examined for species identification. The exuviae of pupae and larvae as well as the larval samples were preserved

in 70% alcohol.

### 3. Methods for the mounting of specimens

The adult specimens were examined, as a rule, under a stereomicroscope for the preliminary identification. Some specimens, such as those belonging to genus *Cricotopus*, could be identified under low power magnifications. Most of the other adult specimens were transferred, one by one, on to a slide glass. The wings are cut with sharp forceps from the base leaving squama attached to the body, and are fixed dry under a cover glass 24 mm long and 8 mm wide by applying a drop of manicure paste on both ends. The body parts are digested in hot 10% potassium hydroxide solution in a small beaker for a few minutes, washed with water, transferred onto the slide glass, and dissected with needles in a drop of gum-chloral solution. The antenna, head, antepnotum, scutum and scutellum, other thorax parts together with legs, and the abdomen, were separated, placed in right positions, and mounted in the gum-chloral solution under a 18×18 mm cover glass.

The gum-chloral solution was prepared by dissolving 30 g of chloral hydrate and 8 g of arabic gum in a mixture of 10 ml water, 1 ml of glacial acetic acid, and 3 ml of glycerin in hot bath.

### 4. Terminology and abbreviations

The terminology of external structures of adults, methods of standard measurements, and the abbreviations used in the present paper are almost the same as in the previous papers by SASA (1978, p.3) and SASA & HASEGAWA (1983, p.308). In the present paper, some alterations in the abbreviations and additions of measurement data were made, as follows.

**BL**: body length as expressed by the combined length of thorax and abdomen in mounted specimens, in mm. **WL**: wing length, as measured from the base of vein R (tip of arcus) to the tip of wing, in mm. **AR**: antennal ratio, length of last segment divided by the combined length of the preceding flagellar segments, not including pedicel. **AHR**: antennal hair ratio, the length of the longest hair on the short last antennal segment divided by the total length of antenna. **ER**: eye ratio, the distance between the dorsomedial corners of the eyes divided by the height of the eye. **so**: number of the supraorbital setae on one side. **cl**: number of the clypeal setae. **pn**: number of fringe lateral antepnotal setae. **dm**: number of dorsomedian setae (acrostichal setae) of scutum. **dl**: number of dorsolateral setae (dorsocentral setae) of scutum. **pa**: number of prealar setae. **sc**: number of scutellar setae. **sq**: number of fringe hairs on squama. **RR**: radius ratio, the distance between the tips of R1 and R2+3 divided by the distance between tips of R1 and R4+5. **VR**: venarum ratio, the length of vein Cu divided by the length of vein R. **fLR** (LR1): length of front tarsus I divided by the length of front tibia. **mLR** (LR2): length of middle tarsus I divided by length of middle tibia. **hLR** (LR3): length of hind tarsus I divided by length of hind tibia. **fTR**: length of front tarsus V divided by length of front tibia. **fBR** (BR1): length of longest hair on front tarsus

I divided by the diameter of front tarsus I at the base of the hair. **mBR** (BR2) : ditto, middle tarsus I. **hBR** (BR3) : ditto, hind tarsus I.

**Table 1.** List of species collected from the Stream Itachigawa, Toyama

	Page	Fig. No.
1. <i>Chironomus kiiensis</i> TOKUNAGA, 1936	29	
2. <i>Chironomus nipponensis</i> TOKUNAGA, 1940	29	
3. <i>Chironomus yoshimatsui</i> MARTIN et SUBLETTE, 1972	29	
4. <i>Paratendipes tamayubai</i> SASA, 1983	30	
5. <i>Pentapedilum shirokanense</i> SASA, 1979	30	
6. <i>Pentapedilum uncinatum</i> GOETGHEBUER, 1921	30	
*7. <i>Polypedilum convictum</i> (WALKER, 1856)	30	
8. <i>Polypedilum cultellatum</i> (GOETGHEBUER, 1931)	30	
9. <i>Polypedilum japonicum</i> (TOKUNAGA, 1938)	30	
10. <i>Polypedilum kyotoense</i> (TOKUNAGA, 1938)	31	
11. <i>Polypedilum tamagoryoense</i> (SASA, 1980)	31	
12. <i>Neozavrelia bicoliocula</i> (TOKUNAGA, 1938)	31	1A
13. <i>Rheotanytarsus kyotoensis</i> (TOKUNAGA, 1938)	33	
14. <i>Rheotanytarsus tamaquintus</i> SASA, 1980	33	
15. <i>Tanytarsus oyamai</i> SASA, 1979	33	
16. <i>Tanytarsus tamadecimus</i> SASA, 1980	33	
17. <i>Cricotopus bicinctus</i> (MEIGEN, 1818)	33	
18. <i>Cricotopus bimaculatus</i> TOKUNAGA, 1936	34	
*19. <i>Cricotopus matudigitatus</i> sp. nov.	34	1a-l
20. <i>Cricotopus metatibialis</i> TOKUNAGA, 1936	35	
21. <i>Cricotopus triannulatus</i> (MACQUART, 1826)	35	
22. <i>Cricotopus trifasciatus</i> (PANZER, 1809)	35	
23. <i>Cricotopus yatabensis</i> SASA, 1979	35	
24. <i>Nanocladius tamabicolor</i> SASA, 1981	36	
25. <i>Paratrachocladius rufiventris</i> (MEIGEN, 1830)	36	
26. <i>Rheocricotopus chalybeatus</i> (EDWARDS, 1929)	36	
27. <i>Brillia longifurca</i> KIEFFER, 1921	36	1B
28. <i>Diplocladius cultriger</i> KIEFFER, 1908	37	
29. <i>Eukiefferiella chuzenona</i> SASA, 1984	38	2a-n
30. <i>Eukiefferiella chuzeoctava</i> SASA, 1984	39	2A-H, 3I-N
*31. <i>Eukiefferiella coerulescens</i> (KIEFFER, 1926)	41	3a-h
32. <i>Orthocladius kanii</i> (TOKUNAGA, 1939)	41	
33. <i>Orthocladius glabripennis</i> (GOETGHEBUER, 1921)	43	
34. <i>Orthocladius tamarutilus</i> SASA, 1981	43	1C

35. <i>Limnophyes hudsoni</i> SAETHER, 1975	44 4a-j
36. <i>Limnophyes tamakireides</i> SASA, 1983	46 4A-E
37. <i>Limnophyes tamakitanaides</i> SASA, 1981	47 5a-i
*38. <i>Parakiefferiella itachiquarta</i> sp. nov.	49 5A-G, 6H-M
39. <i>Parametriocnemus stylatus</i> (KIEFFER, 1924)	52 12A-D
*40. <i>Pseudorthocladus matusecundus</i> , sp. nov.	52 6a-j
*41. <i>Pseudosmittia itachisecunda</i> , sp. nov.	53 7a-l
*42. <i>Pseudosmittia itachibifurca</i> , sp. nov.	54 7A-I, 8J
43. <i>Smittia aterrima</i> , (MEIGEN, 1818)	57 8A-B
*44. <i>Smittia itachinudiocula</i> , sp. nov.	59 8a-j
*45. <i>Smittia itachituberculata</i> , sp. nov.	60 9a-f
*46. <i>Smittia itachipennis</i> , sp. nov.	60 9A-K
*47. <i>Toyamayusurika shiotanii</i> , gen. nov., sp. nov.	62 10a-l
*48. <i>Triossocladus itachigranulatus</i> , sp. nov.	65 11a-j
*49. <i>Thienemanniella morosa</i> , (EDWARDS, 1924)	67 11A-H, 12I-K
*50. <i>Psilodiamesa matunigra</i> , sp. nov.	68 12a-l
51. <i>Syndiamesa takatensis</i> , TOKUNAGA, 1936	69

\*New records from Japan, including new speceis.

## A. Subfamily CHIRONOMINAE

### A.A. Tribe CHIRONOMINI

#### 1. *Chironomus kiiensis* TOKUNAGA, 1936

A male emerged from a bottom sample collected at No.8 of the Stream Itachigawa on 3 September 1983.

*Remarks* : This is a species commonly found in rather polluted streams and ponds, and the morphology was redescribed by HASHIMOTO (1977a, p.83 ; 1977b, p.80) and SASA (1978, p. 15).

#### 2. *Chironomus nipponensis* TOKUNAGA, 1940

A male was collected at D, the Stream Matsukawa, on 24 May 1983.

*Remarks* : This is another widely distributed species of this genus in Japan, and the morphology was redescribed by HASHIMOTO (1977a, p.83 ; 1977b, p.81) and SASA (1978, p.16).

#### 3. *Chironomus yoshimatsui* MARTIN et SUBLETTE, 1972

A total of 103 males were collected at D, E, F, and G of the Matsukawa on 24 May 1983. 9 males were collected at No.3, 4, 5, 6 and No.5, 7 and 8 of the Itachigawa on 16 April 1986.

*Remarks* : This is the species predominantly breeding in medium to highly polluted sewage ditches and rivers in Japan, and was formerly called by various Japanese workers as

*Ch. dorsalis* MEIGEN. Its morphology was given also by HASHIMOTO (1977a, p.82 ; 1977b, p. 79), and SASA (1978, p.23).

**4. *Paratendipes tamayubai* SASA, 1983**

A male was collected at F, the Matsukawa, on 24 May 1983 (No.A 107 : 32).

*Remarks* : This is a species collected in large numbers from a small unpolluted mountain stream running into the River Tama (SASA, 1983, P.9), and was recently collected also on the shore of Lake Biwa.

**5. *Pentapedilum shirokanense* SASA, 1979**

2 males emerged from a bottom sample collected at D and E of the Matsukawa on 24 May 1983.

*Remarks* : This species was described by SASA (1979, p.10) with male, female, pupa and larva collected from a water tank in the campus of the Institute of Medical Science, University of Tokyo.

**6. *Pentapedilum uncinatum* GOETGHEBUER, 1921**

2 males were collected at No.5 on 6 July 1986 (No.A 116 : 71A, 72B).

*Remarks* : This species was recorded by SASA & KIKUCHI (1986) from a rice paddy area in Tokushima.

**7. *Polypedilum convictum* (WALKER, 1856)**

A male was collected at F, the Matsukawa, on 24 May 1983 (No.A 107 : 30).

*Remarks* : This is a new record for Japan, and is characterised, as being a member of the *cultellatum* group of genus *Polypedilum*, with only a single long seta on posterior lobe of dorsal appendage.

**8. *Polypedilum cultellatum* (GOETGHEBUER, 1931)**

6 male emerged from a sample collected at A, the Matsukawa ; also 1 male at No.6,7, and 164 males at No.8, of the Itachigawa, collected all on 24 May 1983.

*Remarks* : This is a species commonly found in relatively polluted streams and lakes in Japan. This species seems to show a wide range of morphological variations in Japan than known in Europe, and was first recorded by a name of *Microtendipes ureshinoensis* by SASA (1979, p.19) from a polluted stream in Ureshino (Saga), and later redescribed as *P.cultellatum* by SASA & HASEGAWA (1983), and SASA (1985b, c).

**9. *Polypedilum japonicum* (TOKUNAGA, 1938)**

Altogether 15 males emerged from bottom samples collected at A, C, D and E of the Matsukawa on 24 May 1983.

*Remarks* : This is a species of the *Tripodura* group of *Polypedilum*, and has also been recorded by SASA & KIKUCHI (1986) from a rice paddy area in Tokushima.

**10. *Polypedilum kyotoense* (TOKUNAGA, 1938)**

A male emerged from a sample collected at No.8 on 24 May 1983.

*Remarks* : This species was described by the original author with specimens collected at the Botanical Garden of Kyoto, and was reported to be one of the predominant species breeding in rice paddies by KIKUCHI *et al.* (1985) in Tokushima, and by SASA (1985d) to have bred massively from rice paddies in Toyama, acting as one of the major allergens of bronchial asthma.

**11. *Polypedilum tamagoryoense* SASA, 1980**

A male emerged from a sample collected at E, the Stream Matsukawa, on 24 May 1983.

*Remarks* : This species was recorded by SASA (1980, p.36) with specimens collected at No. 5, a rather polluted part of the Minamiasakawa River, Tokyo.

**12. *Neozavrelia bicolioacula* (TOKUNAGA, 1938)**

(Fig. 1 A)

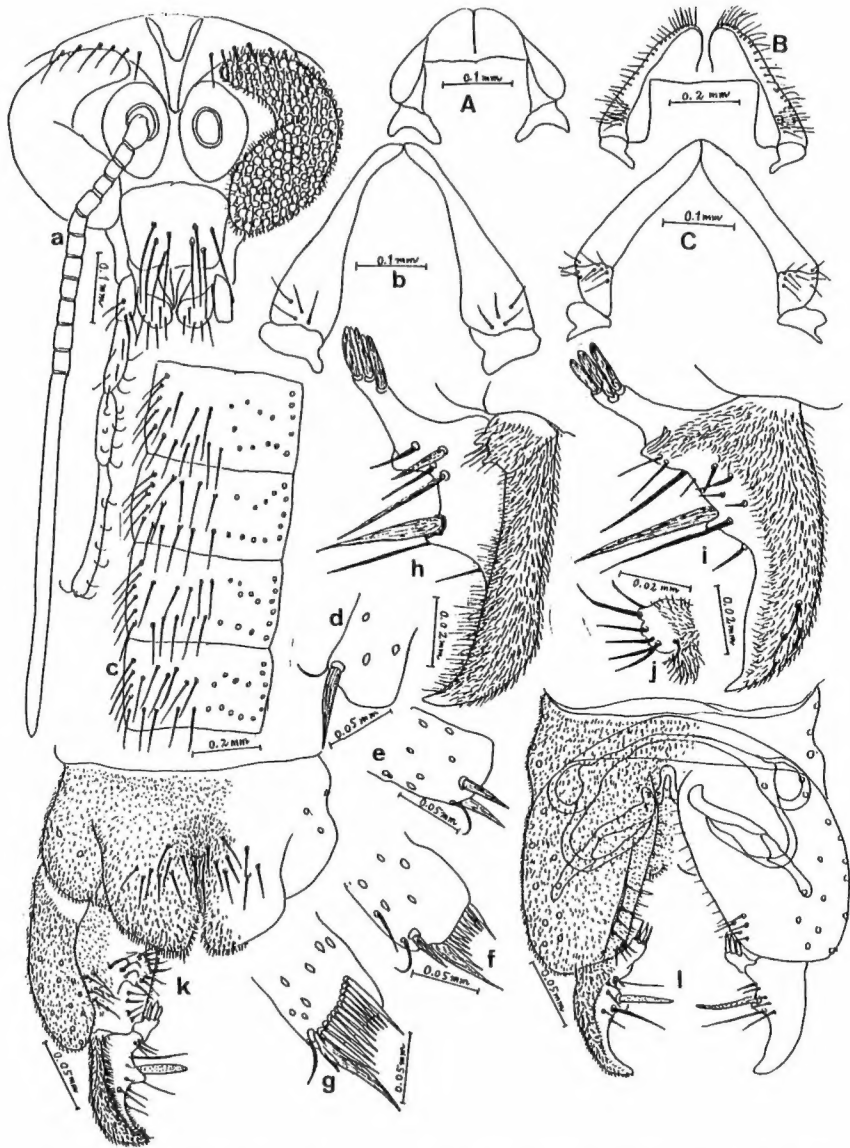
Altogether 8 males emerged from bottom samples collected on 24 May 1983, 2 from a sample at A, the Stream Matsukawa, 5 from those at No.6, and 1 from that at No.7 of the Itachigawa.

*Male* : BL 1.48-1.76 (1.60 in average of 8) mm, WL 0.87-1.02 (0.94) mm. Body almost entirely pale yellow, scutal stripes and postnotum brownish yellow. Eyes bare, reniform, without dorsomedial projection and widely apart from each other, ER 1.31-1.43 (1.39). Antenna composed of only 10 flagellar segments, AR 0.58-0.67 (0.62), AHR 0.39-0.44 (0.41). Palp composed of 4 flagellar segments (20, 57, 78, 126  $\mu$ ), so 5, 6 or 8 on one side (mean 6.6), cl 10-14 (11.5). Anteprepronotum (Fig.1 A) widely separated in the middle, without lateral setae. dm 8-12 (10.0), dl 6-8 (6.6), pa 1 on one side in all the available specimens, sc 6 in 7, 5 in one specimen. Squama bare. Wing cuneiform, anal lobe flat. Wing membrane with relatively small numbers of macrotrichiae on distal 1/3, i.e. 26-32 (28.6) in cell between R4+5 and M, 9-13 (10.3) on vein M, and 5-7 (6.6) between M and Cul. Vein R2+3 almost fused with R4+5. Costa ending much proximal to the tip of wing and at the end of R4+5. Cross vein r-m short and almost parallel to wing axis. fCu much beyond r-m, VR 1.35-1.44 (1.38). Anal vein ending before fCu. fLR 1.77-1.84 (1.81), mLR 0.44-0.48 (0.46), hLR 0.51-0.55 (0.53), fTR 0.33-0.35 (0.34), fBR 3.8-4.0 (3.9), mBR 4.7-6.4 (5.7), hBR 6.7-8.7 (7.7). Tarsi IV longer than tarsi V in all legs. Pulvilli absent.

Hypopygium as illustrated by SASA & KAWAI (1987). Bands of ninth tergite united in the middle. Anal point broad and apically rounded, with a pair of lateral ridges at the base and with numerous small granules but without lateral and dorsal setae.

*Remarks* : This species was recorded by TOKUNAGA (1938, P.371) by the name of





**Fig.1.** Anteprenotum of male of **A:** *Neozavrelia biciliocula* (TOKUNAGA), **B:** *Brillia longifurca* KIEFFER, **C:** *Orthocladus tamarutulus* SASA.

*Cricotopus matudigitatus*, sp. nov., male. **a:** head. **b:** anteprenotum. **c:** abdominal tergites II to V. **d:** tip of front tibia. **e:** tip of middle tibia. **f, g:** tip of hind tibia. **h:** gonostylus, dorsal view. **i:** gonostylus, ventral view. **j:** inner process of gonocoxite. **k:** hypopygium, dorsal view. **l:** hypopygium, ventral view.

*Tanytarsus (Stempellina) bicolioeculus* with male and female specimens collected in Kyoto. Specimens of apparently the same species were collected by SASA on the shore of Lake Biwa, and Taikôyama, Toyama, in large numbers swarming in the air, and redescribed by SASA & KAWAI (1987) as a member of genus *Neozavrelia* GOETGHEBUER, 1941, together with *Tanytarsus tamanonus* SASA collected from an upstream part of the Tama River.

**13. *Rheotanytarsus kyotoensis* (TOKUNAGA, 1938)**

3 males emerged from a sample collected at A, another male at E of the Matsukawa, and a total of 9 males from samples at No.6, No.7 and No.8 of the Stream Itachigawa, all collected on 24 May 1983. A male was collected at No.4 on 5 November 1985.

*Remarks* : This species was described by TOKUNAGA (1938, p.345) as being abundantly found along a slow stream, and was collected in large numbers at rather polluted sites of the Minamiasakawa and the Tama River by SASA (1980, p.19 ; 1983, p.20).

**14. *Rheotanytarsus tamaquintus* SASA, 1980**

A male emerged from a sample collected at E on 24 May 1983.

*Remarks* : This species was collected at Stations 2 and 3, slightly polluted sites of the River Minamiasakawa, by SASA (1980, p.18).

**15. *Tanytarsus oyamai* SASA, 1979**

A male emerged from a sample at A, and 4 males at No.6, collected on 24 May 1983.

*Remarks* : This is the most common species breeding in rice paddies and other stagnant waters (SASA, 1979, p.3 ; SASA & KIKUCHI, 1986, p.29), and was shown to be a potent allergen causing bronchial asthma in some patients (IGARASHI et al., 1986, p.687).

**16. *Tanytarsus tamadecimus* SASA, 1980**

A male emerged from a sample at A collected 24 May 1983.

*Remarks* : This species was described by SASA (1980, p.26) with specimens emerged from No.3, the Minamiasakawa River, Tokyo.

**B. Subfamily ORTHOCLADIINAE**

**B.A. Tribe ORTHOCLADIINI**

**B.A.A. the *Cricotopus* complex**

**17. *Cricotopus bicinctus* (MEIGEN, 1818)**

A total of 78 males were collected at D and E, on the bank of the Matsukawa, 24 May 1983. A total of 78 males emerged from bottom sample collected at A, B, C, D, E of the Matsukawa and No.7, 8, 9 of the Itachigawa on the same day. 6 males were collected at No. 6, 7 and 8 on 5 November 1985, 5 males and 2 females at No.6, 7 and 10 on 16 April 1986, 56 males and 10 females at No.5 on 6 July 1985.

*Remarks* : This is a species widely distributed in Europe, and was recorded from Japan by TOKUNAGA (1936, p.16, from Kyoto), and SASA (1979, p.37, from Nagasaki ; 1980, p.11 ; Minamiasakawa River, 1983, p.72, from Tama River ; 1985, p.58, from Lake Ikeda).

**18. *Cricotopus bimaculatus* TOKUNAGA, 1936**

(Figs. 1 a-l)

Altogether 19 males emerged from bottom samples collected at A, B, C, E of the Matsukawa and No.7, 8 of the Itachigawa on 24 May 1983. A male was collected at No.1 of the Itachigawa on 5 November 1985. 6 males emerged from a sample collected at No.2, a male at No.4, on 16 April 1986.

*Remarks* : This species was described by TOKUNAGA (1936, p.27) from Kyoto, and was also recorded by SASA & KAWAI (in press) from Lake Biwa.

**19. *Cricotopus matudigitatus*, sp. nov.**

A male was collected with insect net on the shore of the Matsukawa at A, 24 May 1983. Holotype : No.A 107 : 07.

*Male* : BL 2.93 mm, WL 1.76 mm. Body almost entirely dark brown. Scutum dark brown, stripes black, scutellum and postnotum dark brown, abdominal tergites almost uniformly dark brown excepting tergites I, II and hypopygium as well as proximal parts of tergite III, IV and V, which are brown and slightly paler. Leg segments almost uniformly dark brown and without pale bands.

Head in Fig.1 a. Eyes pubescent, each with a conspicuous dorsomedial projection, ER 0.60 (unusually small as a species of Orthocladiinae). Antenna with 13 flagellar segments, AR 1.78, AHR 0.50. so 8 : 8, cl 8, pn 4 : 4. dm 10, dl 12 on each side, all minute, decumbent and arising from small pits. pa 4 : 4, sc 16. Squama with 8 : 8 fringe hairs. Wing bare, brownish, R2+3 ending about midway between ends of R1 and R+5, RR 1.51. fCu slightly beyond r-m, VR 1.07. Anal vein extending much beyond fCu. Costa not extending beyond end of R4+5.

Front tibia with a long terminal spur (45  $\mu$  ; Fig.1 d), middle tibia with two short terminal spurs (Fig.1 e), hind tibia with a long terminal spur (62  $\mu$ ), a short terminal spur (32  $\mu$ ), and a terminal comb composed of 12 free spurs (28-55  $\mu$  ; Figs.1 f, g). fLR 0.68, mLR 0.51, hLR 0.59, fTR 0.13, fBR 2.5, mBR 2.6, hBR 3.8. Pulvilli absent, claws and empodium well developed.

Hypopygium in Figs.1 k, l. Ninth tergite with 12 short setae in the middle portion. A small, narrow anal point seems to be present but needs to be confirmed when additional specimens become available and examined from lateral aspect. Gonocoxite with a small inner lobe bearing strong setae (Fig.1 j). Gonostylus highly complicated in structure (Figs. 1 h, i). It is widest at base and apically pointed like a beak, without apical spur, and with three processes on the inner side ; a long, finger-like and orally directed basal process bearing 5 blade-like setae at the tip ; a low, blunt but highly chitinated and pigmented process at the

base of the basal process, bearing 3 or 4 long setae on the dorsal side and 4 or 5 short setae on the ventral side ; an angulate and pointed process at about middle of gonostylus bearing a long ( $42\ \mu$ ) and stout ( $4\ \mu$  wide at the base) but sharply pointed seta on the dorsal side, and a narrow and long ( $45\ \mu$ ) seta on the ventral side.

*Remarks* : This species is obviously a member of the genus *Cricotopus* VAN DER WULP, 1874, in wider sense, since wings are bare, squama fringed, eyes pubescent, and both dorsomedian and dorsolateral setae of scutum are small, decumbent, and arising from small pits. Most of the previously known species of this genus have no anal point and with only simple appendages on gonocoxite and gonostylus, but the present species has highly complicated processes and setae, and is considered as a member of a new subgenus to be described in a separate paper.

#### **20. *Cricotopus matatibialis* TOKUNAGA, 1936**

6 males emerged from bottom samples collected at E on 24 May 1983. 3 males were collected at G on the same day. 3 males were collected at No.1 and No.6 on 5 November 1985, 4 males at No.4 on 16 April, and 2 males at 5 on July 1986.

*Remarks* : This species was described by TOKUNAGA (1936, p.21) from Kyoto, and was recorded by SASA (1981, p.16 ; 1983, p.71) from the unpolluted, upstream sites of the Tama River, Tokyo.

#### **21. *Cricotopus triannulatus* (MACQUART, 1826)**

41 males were collected at C, D, E, F on 24 May 1983. A total of 51 males emerged from samples collected at A, B, C, D, E, F and 15 males from those at No.7 and 8, on the same day. A total of 6 males were collected also at No.1, 6 and 8 on 5 November 1985. Also a total of 5 males at No.7 and No.10 on 16 April, and 2 males at No.5 on 6 July 1986.

*Remarks* : This is a species widely distributed in Europe, and was recorded by TOKUNAGA (1936, p.12) from Kyoto and Shiga, and by SASA (1981, p.13 ; 1983, p.72) from polluted sites of the Tama River, Tokyo.

#### **22. *Cricotopus trifasciatus* (PANZER, 1809)**

8 males were collected at E and F on 24 May 1983. 7 males emerged from a sample at E. 3 males were collected at No.6 and No.8 on 5 November 1985, 2 males at No.5 on 6 July 1986.

*Remarks* : This is a species distributed in Europe, and was recorded by TOKUNAGA (1936, p.15) from Kyoto and Tottori, and SASA (1981, p.11, 87 ; 1983, p.72) from polluted sites of the Tama River, Tokyo.

#### **23. *Cricotopus yatabensis* SASA, 1979**

8 males were collected with insect net at E and F of Matsu River on 24 May 1983, and

2 males at No.5 of the Stream Itachigawa on July 1986.

*Remarks* : This species was described by SASA (1979, p.41) with specimens found breeding in concrete pools at the National Institute for Environmental Studies, Yatabe (Ibaraki), and was collected also on the shore of Lake Sainoko (Yamanashi) by SASA (1985c, p.121).

**24. *Nanocladius tamabicolor* SASA, 1981**

3 males were collected at C and D on 24 May 1983. 18 males emerged from samples collected at A, C and E, and 3 males at No.8 and No.10 on 24 May 1983.

*Remarks* : This species was recorded by SASA (1981, p.29) from Stations 4, 5 and 6 (the more polluted sites) of the Minamiasakawa River, Tokyo, and also by SASA & KAWAI (in press) at Otsu City, on the shore of Lake Biwa.

**25. *Paratrichocladius rufiventris* (MEIGEN, 1830)**

4 males were collected at D and E on 24 May 1983. A total of 28 males emerged from samples collected at B, D and E, and a male from that at No.8 on the same day. 12 males were collected at No.1, 3, 4 and 5 on 5 November 1985. 7 males at No.1, 4, 5, 7 and 10 on 16 April, and 4 males and 2 females at No.5 on 6 July, 1986.

*Remarks* : This species is known to be found widely in Europe, and was recorded by SASA (1979, p.34) from artificial streams built in NIES (Ibaraki), and also by SASA (1983, p.71) from F, H and I (downstream sites) of the Tama River, Tokyo.

**26. *Rheocricotopus chalybeatus* (EDWARDS, 1929)**

13 males emerged from samples collected at A and E, another 8 males from those at No. 7, 8 and 10, on 24 May 1983.

*Remarks* : This species was first described from England, recorded by TOKUNAGA (1938, p.319) from Osaka and Kyoto, and SASA & KAWAI (in press) on the shore of Lake Biwa at Otsu City.

**B.A.B. the *Brillia* complex**

**27. *Brillia longifurca* KIEFFER, 1921**

(Fig. 1 B)

A male was collected at No.5, 16 April 1986 (No.116 : 81). 3 males were collected also at Inami (Toyama) on a small mountain stream (No.A 110 : 71-73).

*Male* ; Body length 4.29-4.49 (4.38 in average of 4) mm, wing length 2.70-2.81 (2.76) mm. Ground color of scutum yellow, stripes dark brown, scutellum brown, postnotum dark brown, abdominal tergites I-V brown laterally and dark brown along midline, VI to hypopygium dark brown. Eyes bare, each with a long dorsomedial projection, ER 0.43-0.63 (0.49). Antenna with 13 flagellar segments, AR 1.52-1.67 (1.60), AHR 0.51-0.56 (0.54). so 27-39 (36.0), cl 32-34 (32.8). Anteprepronotum (Fig.1 B) narrow, separated in the middle, with 18-27 (22.5) dorsal and 15-22 (18.2) lateral setae. Scutum without dorsomedian setae, with 68-82 (76.0)

dorsolateral setae, and 20-26 (23.7) prealar setae, on each side. Scutellum with 64-75 (71.8) setae in multiple rows. Wing with numerous macrotrichiae on the veins and membrane. Squama with 40-46 (43.2) fringe hairs. R2+3 almost fused with R1, RR 0.17-0.24 (20.8). Costa produced beyond end of R4+5. fCu much beyond r-m, VR 1.24-1.36 (1.29). Anal vein extending much beyond fCu. Anal lobe obtuse. Front tibia with a long terminal spur (75  $\mu$ ). Middle tibia with two relatively long terminal spurs (83, 87  $\mu$ ). Hind tibia with a long terminal spur (116  $\mu$ ), a shorter terminal spur (85  $\mu$ ), and a terminal comb composed of 8 free spurs (46-84  $\mu$ ). fLR 0.82-0.86 (0.84), mLR 0.53-0.57 (0.55), hLR 0.54-0.56 (0.55), fTR 0.13-0.14 (0.14), all relatively high as a member of Orthocladiinae. Tarsi with numerous long beards, fBR 3.5-4.1 (3.8), mBR 5.1-6.0 (5.6), hBR 5.6-7.2 (6.4). Claws simple and with pointed apex, empodium small, pulvilli absent.

Hypopygium as illustrated by SASA (1984, Fig.79). Ninth tergite with 16-20 (17.6) long setae on both sides, leaving the middle portion bare. Gonocoxite with a long, finger-like inner lobe. Gonostylus forked into two arms, the inner arm about half as long as the outer arm.

*Remarks* : This is a species recorded by various authors from Europe, and was collected also from a small stream in Nikko (Tochigi) by SASA (1984, p.81). In Toyama, adults were collected also while swarming on a small mountain stream at Inami, and seems to represent fauna of clean streams.

## **28. *Diplocladius cultriger* KIEFFER, 1908**

A male was collected at No.1 on 16 April 1986 (No.A 113 : 10A).

*Male* : Body length 3.24 mm, wing length 2.38 mm. Body almost entirely black or dark brown; scutum, and postnotum black, halteres dark brown, abdominal tergites dark brown, femora and tibiae black, tarsi slightly paler. Eyes highly pubescent, reniform, ER 1.22. Antenna with 13 flagellar segments, AR 1.89, AHR 0.51, last segment slightly swollen apically, with numerous short and curved sensory setae in the apical portion. so 2 : 2, cl 4, pn 2 : 2, dm 0, dl 6, pa 2, sc 6. Squama bare. Wing membrane bluish, finely granular. Costa not extending beyond end of R4+5. R2+3 ending about midway between ends of R1 and R4+5, RR 0.49. fCu almost under r-m, VR 1.03. Cu2 curved in the middle. Anal vein extending much beyond fCu. Anal lobe slightly more obtuse than the right angle. Front tibia with a long terminal spur (58  $\mu$ ), middle tibia with two short terminal spurs (36, 44  $\mu$ ), hind tibia with a long terminal spur (60  $\mu$ ), a short terminal spur (40  $\mu$ ), and a terminal comb composed of 12 free spurs (26-54  $\mu$ ). Tarsi without terminal spurs. Tarsi IV longer than tarsi V. All legs with two claws, an empodium, and a pair of small pulvilli.

Hypopygium as illustrated by SASA (1984, p.200). Posterior margin of ninth tergite almost flat, not produced posteriorly towards the middle, with a needle-like seta arising from a small tubercle on the posterior margin. Inner lobe of gonocoxite long, finger-like, covered thickly with microtrichiae, and bearing long, curved setae in the apical portion and along

inner margin. Gonostylus bilobed, inner arm almost as long as the outer arm, apical spur absent.

*Remarks* : This species was recorded by TOKUNAGA (1964, p.17) from Mount Yukyu (Niigata), and by SASA (1984, p.83) from Lake Yunoko (Tochigi).

### B.A.C. the *Orthocladus* complex

#### 29. *Eukiefferiella chuzenona* SASA, 1984

(Figs. 2 a-n)

A male was collected at Station No.1 on 16 April 1986 (No.A 113 : 07).

*Male* : Body length 2.69 mm, wing length 2.10 mm. Scutum, scutellum, postnotum entirely black, abdominal tergites dark brown, all femora, tibiae and front tarsi black, middle and hind tarsi dark brown, halteres brown. Head in Fig.2 a. Eyes bare, each with a conspicuous dorsomedial projection, ER 1.00. Antenna with 13 flagellar segments, AR 0.84, AHR 0.44, last segment conspicuously swollen near apex and with 6 or 8 short and curved sensory setae near apex (Fig.2 b). so 8 on each side, cl 6. Anteprepronotum (Fig.2 c) narrow but united in the middle, with 5 and 6 lateral setae. Scutum and scutellum in Fig.2 d. Dorsomedian setae of scutum 10, all very small and each arising from a small pit. Dorsolateral setae 8 or 9, each arising from a large pale pit. Prealar setae 3 or 4. Scutellar setae 11. Wing membrane bare, smooth, and slightly brownish. Wing venation in Fig.2 e. R2+3 separated from R4+5, ending near tip of R4+5, RR 0.26. Costa not extending beyond end of R4+5. Tips of R4+5 and Cul almost on the same level of wing axis. fCu beyond r-m, VR 1.23. Anal vein extending much beyond fCu, but not reaching to near wing margin. Anal lobe nearly rectangular. Squama with 10 fringe hairs. Tips of front tibia with a long terminal spur (50  $\mu$ ; Fig.2 f). Middle tibia with two short terminal spurs (18 and 28  $\mu$ ; Fig. 2 g). Hind tibia with a long terminal spur (58  $\mu$ ), a short terminal spur (20  $\mu$ ), and a terminal comb composed of 15 free spurs 24-48  $\mu$  long (Fig.2 h). fLR 0.61, mLR 0.49, hLR 0.59, fTR 0.16, fBR 2.8, mBR 3.4, hBR 5.0. All legs with well developed empodium and claws, but pulvilli are absent (Fig.2 i).

Abdominal tergites with more numerous setae than in the next species. Hypopygium in Figs.2 k, l. Ninth tergite with 13 short setae in a V-shaped area. Anal point absent. Inner lobe of gonocoxite (Fig.2 j, n) with rounded margin, bearing short setae on dorsal side, and numerous microtrichiae on the ventral side. Gonocoxite without basal tubercles such as seen in the last species. Virga present (Fig.2 l). Gonostylus (Fig.2 m) simple, slightly swollen subapically, with a large terminal spur.

*Remarks* : This specimen is morphologically almost coincident with that of *E.chozenona* described by SASA (1984, p.74) from Lake Chuzenji, Nikko National Park in Tochigi Prefecture. It is somewhat similar in structure and coloration to the next species, *E.chuzeoctava*, but differs in having eyes with a conspicuous dorsomedial projection, costa not produced beyond end of R4+5, inner lobe of gonocoxite with rounded margin, gonocoxite without basal tubercles, virga present and gonostylus is swollen subapically.

**30. *Eukifferiella chuzeoctava* SASA, 1984**

(Figs. 2 A-H, 3 I-N)

A total of 6 males were collected on the shore of the Itachigawa, 2 males at Station 1 on 5 November 1985 (No. A 110 : 09, 10), 3 males also at No.1 (A 113 : 04A, 05, 06), and a male at No.6 (A 115 : 04), on 16 April 1986.

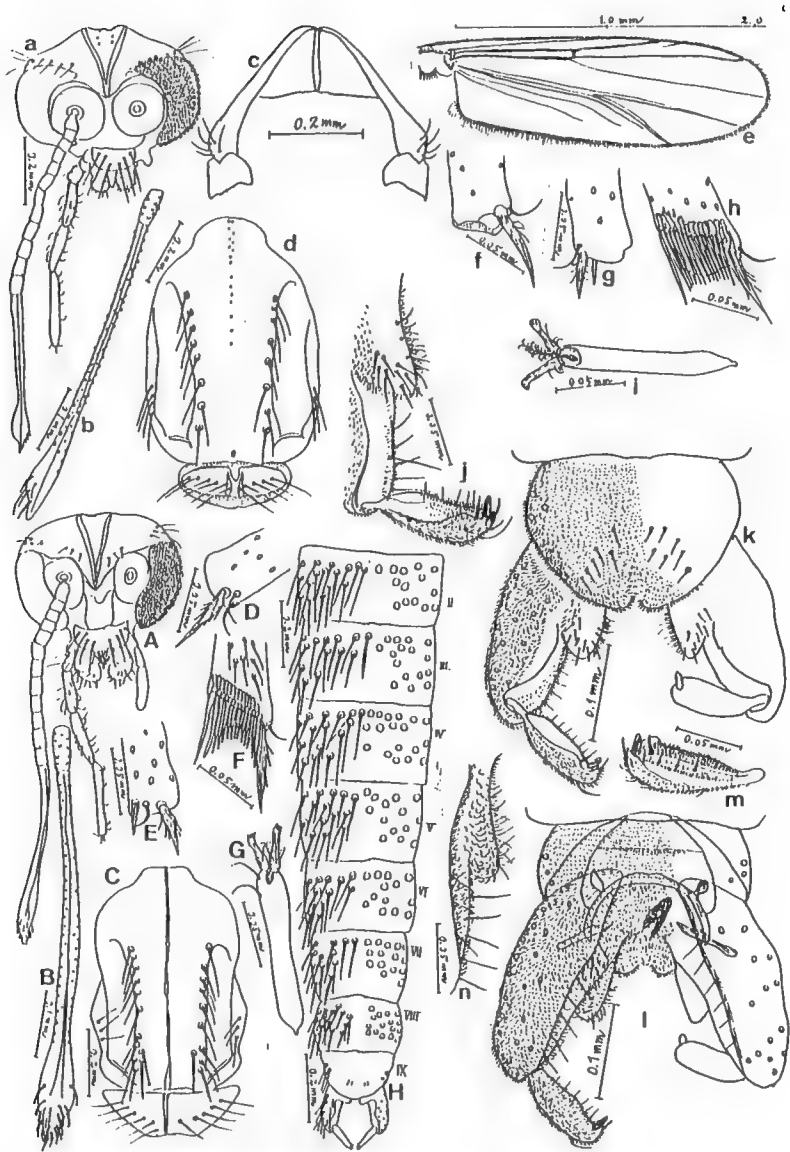
*Male* : Body length 2.48-3.17 (2.81 in average of 6) mm, wing length 1.76-2.17 (1.95) mm. Ground color of scutum dark brown, stripes black, scutellum and postnotum black, abdominal tergites dark brown ; femora of all legs dark brown, tibiae and tarsi I largely brown and gradually darkened towards apex, tarsi II to V dark brown. Head in Fig.2 A. Eyes reniform, inner margin slightly concave and without dorsomedial projection, ER 1.35-1.61 (1.50). Antenna with 13 flagellar segments, AR 0.61-0.94 (0.73), AHR 0.35-0.49 (0.40), last segment swollen at apex and with numerous sensory setae in the apical portion but without apical seta (Fig.2 B). Supraorbital setae 2, 3 or 4 in the median portion and 4 or 5 in the lateral portion of each side. Clypeal setae 6-14 (8.8). Anteprepronotum (Fig.3 J) relatively narrow but united in the middle, with 3-7 (most frequently 4, mean 4.2) lateral setae. Scutum and scutellum in Fig.2 C. Dorsomedian setae 10-14 (12.5), all minute and arising from small pale pits distributed from near anterior margin to about 1/3 of the median line. Dorsolateral setae 6-12 (most frequently 8, mean 8.3) on each side, each arising from a large pale pit. Prealar setae 3 on each side in 5 specimens, and 2 on each side in one specimen. Scutellar setae 10-16 (11.7).

Wing membrane bare, smooth, and brownish. Wing venation in Fig.3 I. R<sub>2</sub>+3 separated from R<sub>4</sub>+5, ending closer to end of R<sub>4</sub>+5, RR 0.22-0.32 (0.27). Costa extending slightly beyond end of R<sub>4</sub>+5. fCu beyond r-m, VR 1.13-1.24 (1.20). Tip of R<sub>4</sub>+5 proximal to tip of Cul. Anal vein reaching to almost wing margin. Anal lobe rounded. Squama with 6-12 (9.3) fringe hairs. fLR 0.62-0.68 (0.65), mLR 0.53-0.57 (0.55), hLR 0.60-0.62 (0.61), fTR 0.16-0.18 (0.17), fBR 3.1-3.5 (3.3), mBR 3.2-4.5 (4.0), hBR 3.4-5.2 (4.2). Front tibia with a long terminal spur (48  $\mu$ ), middle tibia with two short terminal spurs (8  $\mu$ , 14  $\mu$ ), hind tibia with a long terminal spur (52  $\mu$ ), short terminal spur (24  $\mu$ ), and a terminal comb composed of 13 free spurs (22-46  $\mu$ ). Middle and hind tarsi I with two short terminal spurs, middle and hind tarsi II with one or two short terminal spurs. Pulvilli absent.

Distribution of setae on abdominal tergites in Fig.2 H. Hypopygium in Figs.3 K, L. Ninth tergite with 4-6 short setae in a transverse row, anal point absent. Inner lobe of gonocoxite (Figs.3 M, N) single, almost rectangular, with short and curved setae on the dorsal side and numerous microtrichiae on the ventral side. Gonocoxite with a pair of small tubercles at the base of inner margin. Gonostylus simple, widest at about middle and without subapical swelling, with a large apical spine.

*Remarks* : This species was described by SASA (1984, p.74) by males emerged from bottom samples of Lake Chuzenji (Tochigi). It is morphologically somewhat related to the last species, *E.chuzenona*, but can be differentiated by the characters given in the remarks of the last species.





**Fig.2.** *Eukiefferiella chuzenona* SASA, male. a : head. b : last and penultimate segments of antenna. c : anteprenotum. d : scutum and scutellum. e : wing. f : tip of front tibia. g : tip of middle tibia. h : tip of hind tibia. i : front tarsus V. j : inner margin of gonocoxite, and gonostylus. k : hypopygium, dorsal view. l : hypopygium, ventral view. m : gonostylus. n : inner lobe of gonocoxite, dorsal view.

*Eukiefferiella chuzeoctava* SASA. male. A : head. B : last and penultimate segments of antenna. C : scutum and scutellum. D : tip of front tibia. E : tip of middle tibia. F : tip of hind tibia. G : front tarsus V. H : abdominal tergites, distribution of setae.

**31. *Eukiefferiella coerulescens* (KIEFFER, 1926)**

(Figs. 3 a-h)

A male was collected at No.3 on 5 November 1985 (A 111 : 11).

*Male* : Body length 1.90 mm, wing length 1.21 mm. Ground color of scutum yellowish brown, scutal stripes dark brown, scutellum yellowish brown, postnotum dark brown, abdominal tergites yellowish brown, legs and halteres largely yellow. Head (Fig.3 a) with a pair of large frontal tubercles, eyes pubescent, reniform and widely apart from each other, ER 1.52. Antenna with only 12 flagellar segments, last segment relatively short and without terminal seta, AR 0.42, AHR 0.31. Supraorbital seta only 1 on each side, clypeal setae 4. Antepre-notum (Fig.3 b) very narrow but united in the middle, with one lateral seta on each side. Scutum with 2 very small dorsomedian setae, 10 dorsolateral setae on each side (all arising from a large pale pit), 3 prealar setae on each side. Scutellar setae 6. Abdominal tergites (Fig.3 g) with highly reduced numbers of setae.

Wing in Fig.3 c. Vein R1 very short, R2+3 fused with R4+5, which ends far proximal to tip of wing. Costa extending beyond tip of R4+5, and ending far before level of tip of Cul. fCu much beyond r-m, VR 1.58 (unusually large value). Cu2 almost straight. Wing membrane bare, smooth, slightly brownish. Anal lobe nearly rectangular. Squama bare. Front legs missing. Middle tibia with two short spurs (12 and 17  $\mu$ ), mLR 0.49, mBR 2.9. Hind tibia with a long terminal spur (32  $\mu$ ), a short terminal spur (20  $\mu$ ), and a terminal comb composed of 14 free spurs (20-28  $\mu$ ). mLR 0.43, hLR 0.53, hBR 3.1.

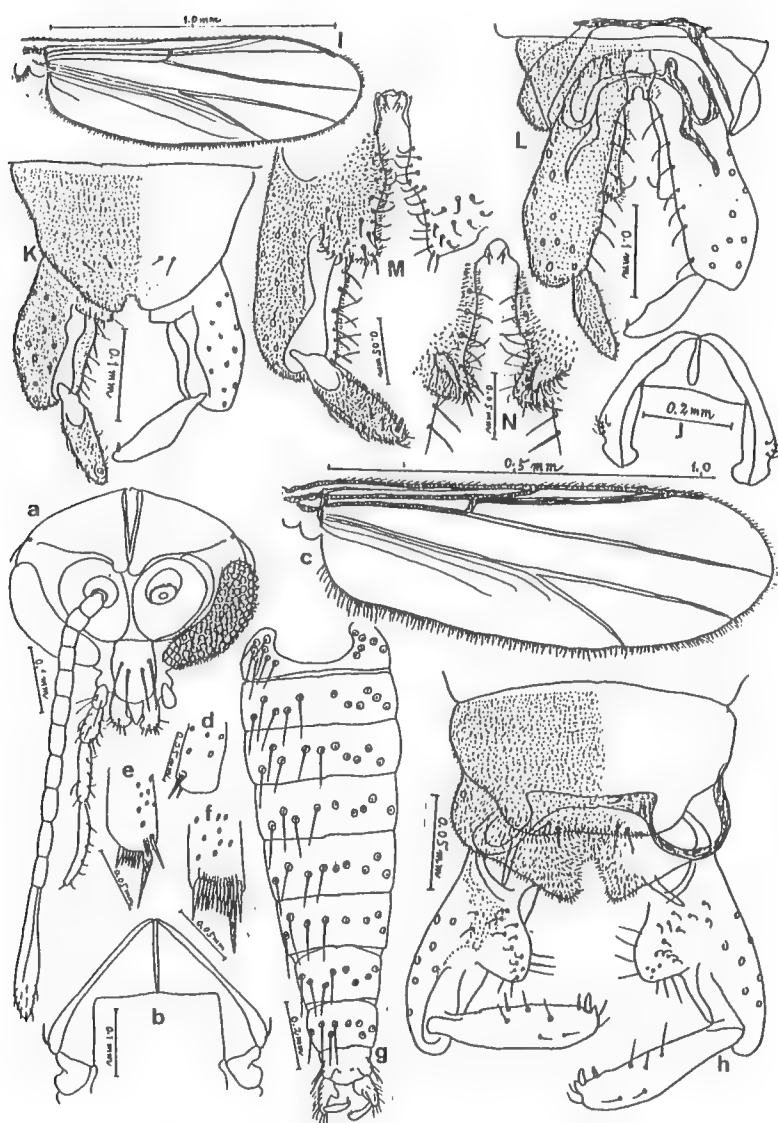
Hypopygium in Fig.3 h. Ninth tergite expanded laterally forming a pair of semicircular framework, and with two pairs of short setae in the middle. Anal point absent. Inner lobe of gonocoxite large and tongue-like, with rounded margin, bearing short setae on dorsal side. Gonostylus simple, inner margin almost straight, without subapical swelling, and with a small terminal spur. Virga present.

*Remarks* : The above morphological characters of the present specimen are almost coincident with that of *Eukiefferiella coerulescens* (KIEFFER, 1926), which was originally described as a member of genus *Trichocladius*, but was redescribed by EDWARDS (1929, p.354) and PINDER (1978, p.64) by the above scientific name. Especially characteristic are the structure of wing veins and of male hypopygium, small AR, the number of antennal segments being only 12, pubescent eyes, and bare squama. However, these descriptions by the European authors on this species are all very short and incomplete, and thus the above scientific name could only provisionally be given to the present specimen.

**32. *Orthocladius* (*Euorthocladius*) *kanii* (TOKUNAGA, 1939)**

A total of 11 males and 2 females were collected with insect net at No.1 (4 males and a female), No.2 (2 males), No.3 (a male), No.4 (2 males), No.7 (a male and a female) and No.8 (a male) on November 5, 1985.

*Remarks* : This species was described by the name of *Spaniotoma* (*Orthocladius*) *kanii* by TOKUNAGA (1939, p.315) from a rapid stream in Kyoto, by SASA (1981, p.87) from No.2



**Fig.3.** *Eukiefferiella chuzeoctava*, **male** (continued). **I**: wing. **J**: antepronotum. **K**: hypopygium, dorsal view. **L**: hypopygium, ventral view. **M**: dorsal view of inner margin of gonocoxite, and gonostylus. **N**: ventral view of inner lobes of gonocoxite.

*Eukiefferiella coerulescens* (KIEFFER), **male**. **a**: head. **b**: antepronotum. **c**: wing. **d**: tip of middle tibia. **e**, **f**: tip of hind tibia. **g**: distribution of setae on abdominal tergites. **h**: hypopygium, dorsal view.

(upstream site) of Minamiasakawa River, and by SASA & KAWAI (1985, p.16) from various localities in Toyama during the snow season.

**33. *Orthocladius (Orthocladius) glabripennis* (GOETGHEBUER, 1921)**

8 males were collected on 5 November 1985 at No.3, 5, 7 and 10. 12 males and 14 females were collected also on 16 April 1986 at No.1 (a male and 11 females), No.2 (2 males), No.3 (a male), No.4 (2 males), No.7 (a male and a female), and No.8 (a male).

*Remarks* : This species was described from Europe, and was recorded by TOKUNAGA (1965, p40) from a mountain stream in Kyoto in February. The identity of the present specimens with the European materials as well as with related species recorded from Japan needs to be confirmed in future especially by comparison of the immature stages, and thus the present identification is a provisional decision.

**34. *Orthocladius (Orthocladius) tamarutilus* SASA, 1981** (Fig,1 c)

5 males and a female were collected at A, on the bank of the Matsukawa, on 24 May 1983 (No.A 107 : 02, 8-11).

*Male* : BL 3.10-3.27 (3.20 in average of 5) mm, WL 1.83-1.90 (1.87) mm. Body largely brown ; ground color of scutum reddish brown, stripes dark brown, scutellum reddish brown, postnotum dark brown, abdominal tergites brown ; all femora dark brown. Eyes bare, each with a rather conspicuous dorsomedial projection, ER 0.90-1.00 (0.95). Antenna with 13 flagellar segments, AR 1.40-1.57 (1.50), AHR 0.50-0.56 (0.53). Palp with 4 flagellar segments. so 8-13 (10.4), cl 8 in all the specimens. Anteprepronotum (Fig,1c) well developed, united in the middle, with 6-10 (8.4) lateral setae. dm 12-16 (13.6), all short and arising from small pits. dl 9-11 (10.0), each arising from a large pale pit. pa 4-6 (4.4). sc 10-14 (12.0) in a transverse line. sq 18-24 (20.3). Wing bare, smooth, slightly brownish. Costa slightly extending beyond end of R4+5, RR 0.35-0.39 (0.37). fCu slightly beyond r-m, VR 1.05-1.11 (1.08). Cu2 slightly curved. Anal vein extending much beyond fCu. fLR 0.66-0.70 (0.68), mLR 0.51-0.54 (0.53), hLR 0.60-0.64 (0.61), fTR 0.13-0.14 (0.14), fBR 2.1-3.0 (2.5), mBR 2.9-3.9 (3.3), hBR 3.3-3.6 (3.5). Front tibia with a long terminal spur (66  $\mu$ ), middle tibia with two short terminal spurs (25, 30  $\mu$ ), hind tibia with a long terminal spur (65  $\mu$ ), a short terminal spur (23  $\mu$ ), and a terminal comb composed of 12 free spurs (27-47  $\mu$ ). Middle tarsi I and II as well as hind tarsus I each with two short terminal spurs, other tarsal segments without terminal spurs. Pulvilli absent.

Hypopygium as illustrated by SASA (1981, Plate 9). Anal point widest at base, roughly triangular and apically pointed, with lateral setae. Inner lobe of gonocoxite double, dorsal lobe narrow and rounded, ventral lobe roughly rectangular. Gonostylus without subapical swelling, inner margin concave, with a strong apical tooth.

*Remarks* : This species was collected from No.3, 4 and 5 (slightly polluted parts) of the Minamiasakawa River (Tokyo), and described by male, female and pupa by SASA (1981, p.85). The present specimens were collected from the least polluted part of the Stream Matsu.

The body coloration is characteristic to this species (most other *Orthocladus* species in Japan are dark brown or black). It can be differentiated also from related Japanese *Orthocladus* species by the presence of dorsomedian setae on scutum, by AR and other measurement data, and by the presence of two short terminal spurs on middle tarsi I and II and hind tarsus I but not on other tarsal segments.

### 35. *Limnophyes hudsoni* SAETHER, 1975

(Figs, 4 a-j)

Altogether 29 males and 3 females were collected on the bank of the Itachigawa. Males: 2 at No.2 2 at No.3, 4 at No.3, 4 No.3, 4 at No.4, 1 at No.5, 1 at No.10, all on 5 November 1985. 1 at No.1 4 at No.2 4 at No.3, and 12 at No.4, on 16 April 1986. Female: 3 at No.1, on 16 April 1986 (Slides No.113: 03B, 15, 84).

*Male*: body length 1.67-2.00 ( $1.80 \pm 0.10$  in average of 10) mm, wing length 1.05-1.15 ( $1.07 \pm 0.04$ ) mm. Scutum, scutellum and postnotum entirely black, abdominal tergites dark brown, halteres dark brown, femora and proximal half of tibiae black, distal half of tibiae and all tarsi dark brown. Head in Fig.4 a. Eyes reniform, without dorsomedial projection, widely apart from each other, ER 1.39-1.80 (mean 1.54). Antenna with 11 (in 7 of 13 specimens) or 12 (6 of 13) flagellar segments, AR 0.65-0.85 (0.72). AHR 0.39-0.47 (0.44). so 4-6 (5.2) on each side, cl 8-12 (10.6). Anteprepronotum (Fig.4 b) well developed and united in the middle, 0 or 1 dorsal seta and 1 or 2 (1.6) lateral setae on each side. Scutum and scutellum in Fig.4 c. Dorsomedian setae 4-8 (5.8), all very short. Dorsolateral setae 9, 10 or 11 (9.8) on each side, all simple and not lanceolate. Prealar setae 3-6 (4.9, most frequently 5). Scutellar setae 4 (in 8 specimens) or 6 (in 2).

Wing membrane granular, slightly bluish. Wing venation in Fig.4 d. Squama with only 1 (in 9 specimens) or 2 (in 1) fringe hairs. Costa extending much beyond end of R4+5. R2+3 separated, RR 0.34-0.43 (0.38). fCu much beyond r-m, VR 1.26-1.35 (1.31). R4+5 ending distal to end of Cul. Cu2 strongly curved at the middle. Anal vein ending under or slightly beyond fCu. Anal lobe obtuse. Front tibia with a long terminal spur ( $48 \mu$ ). Middle tibia with two short terminal spurs ( $18$  and  $20 \mu$ ). Hind tibia with a long terminal spur ( $42 \mu$ ), a short terminal spur ( $20 \mu$ ), and a terminal comb composed of 10 free spurs ( $20-42 \mu$ ). In addition, hind tibia has a row of 8-12 spur-like setae in the distal portion. Tarsi without terminal spurs. Tarsi IV of all legs cylindrical and slightly shorter than tarsi V. Claws and empodium well developed, pulvilli absent. Abdominal tergites with reduced numbers of relatively short setae (Fig.4 e).

Hypopygium in Fig.4 f. Anal point absent, but hind margin of ninth tergite rounded or slightly produced in the middle and bearing numerous short and stout setae on this portion. Inner lobe of gonocoxite composed of two lobes, the narrow and rounded dorsal lobe bearing numerous short setae, and the wide and flat ventral lobe bearing numerous microtrichiae. Gonostylus nearly parallel-sided, truncate apically, and with a large apical spur.

*Female* (measurements with 3 specimens): Body length 2.69, 2.76, 2.83 mm, wing length

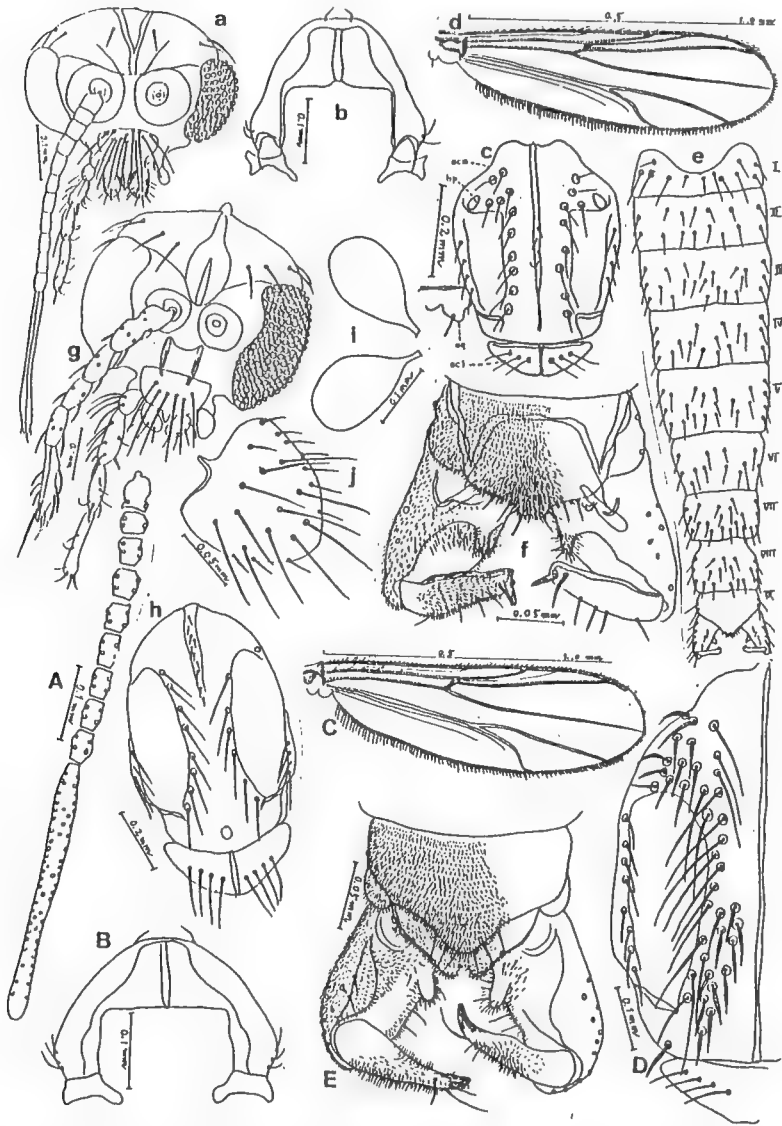


Fig.4. *Limnophyes hudsoni* SAETHER, male. a : head. b : anteprenotum. c : scutum and scutellum (scm : scutum ; hp : humeral pit ; sq : squama ; scl : scutellum). d : wing. e : abdominal tergites. f : hypopygium. female. g : head. h : scutum and scutellum. i : spermathecae. j : cercus.

*Limnophyes tamakireides* SASA, male. A : antenna. B : anteprenotum. C : wing. D : scutum and scutellum, left half. E : hypopygium.

1.76, 2.00 mm. Head in Fig.4 g. Eyes bare, reniform, ER 0.85, 0.85, 0.89 (smaller than in male). Antenna composed of a pedicel and 5 flagellar segments, the last segment with 6, the preceding segments with 2 sensory setae, AR 0.43, AHR 0.42. Supraorbital setae 4 : 4, 6 : 6, 6 : 6, clypeal setae 4, 5, 6. Anteprenotum with 4 lateral setae in all the specimens. Scutum and scutellum in Fig.4 h. dm 8, 10, 10. all very small. dl 6 : 8, 6 : 8, 10 : 12, all simple and not lanceolate. pa 4 : 4, 4 : 5, 4 : 5. Scutellum all with 8 setae. Wing as in male but relatively wider, squama with 5 : 5, 5 : 6, 5 : 6 fringe hairs. RR 0.38, 0.40, 0.40, VR 1.13, 1.14, 1.17. fLR 0.61, 0.62, 0.62, mLR 0.43, 0.44, 0.45, hLR 0.51, 0.52, 0.53, fTR all 0.14, fBR 2.1, 2.2, 2.2, mBR all 2.2, hBR 2.4, 2.4, 2.9. Pulvilli absent. Spermathecae two, oval and dark in color, 82x150, 90x164  $\mu$  (Fig.4 i). Cercus small and about as long as wide (94  $\mu$  long and 90  $\mu$  wide), somewhat pointed caudally, with long and short setae, and thickly covered with microtrichiae (Fig.4 j).

*Remarks* : This species was originally described by SAETHER (1975, p.1032) as common and widely distributed in North America, and also recorded by SASA & KIKUCHI (1986, p.31) from a rice paddy area in Tokushima. In the present study, it was shown to be widely distributed along the upper, and rural portions of the Stream Itachigawa both in April and in November.

### 36. *Limnophyes tamakireides* SASA, 1983

(Figs-4 A-E)

A male was collected at Station 3 on 15 November 1985. Another male was found among the adult specimens collected also at No.3 on 16 April 1986.

*Male* : Body length 2.00, 2.18 mm, wing length 1.28, 1.46 mm. Scutum, scutellum and postnotum black, halteres brown, abdominal tergites dark brown, legs dark brown. Eyes bare, reniform, ER 1.55, 1.70. Antenna (Fig.4 A) 10 or 11 segmented, AR 0.72, 0.86, AHR 0.42, 0.47. so 5 : 5, 7 : 7, cl 12, 16. Anteprenotum (Fig.4 B) very narrowly united in the middle, with 1 dorsal and 2, 3 or 4 lateral setae on each side. Scutum without dorsomedian setae, with 35 : 36, 39 : 40 dorsolateral setae, among which those in the prescutellar and the lateral humeral areas are short and slightly expanded in the middle, while those in the middle area are long and simple. (Fig.4 D). Scutellar setae 7 or 8. Wing membrane granular in appearance. Wing venation in Fig.4 C. Costa extending much beyond end of R4+5. RR 0.32, 0.38, VR 1.25, 1.27. Vein R with 5 or 6 macrotrichiae. Vein Cul ending proximal to end of R4+5. Cu2 strongly curved in the middle, Anal vein extending to below fCu, but not beyond it. Anal lobe obtuse. Squama with 2 : 3, 3 : 3 fringe hairs. Front tibia with a long terminal spur (46  $\mu$ ). Middle tibia with two short terminal spurs (18, 20  $\mu$ ). Hind tibia with a long terminal spur (50  $\mu$ ), a short terminal spur (18  $\mu$ ), and a terminal comb composed of 14 free spurs (19-38  $\mu$ ). fLA 0.50, 0.51, mLR 0.42, hLR 0.53, 0.56, fTR 0.12, 0.13, fBR 2.3, 2.6, mBR 2.5, 2.5, hBR 2.9, 3.3. Pulvilli absent. Tarsi IV cylindrical, but slightly shorter than tarsi V in all legs.

Hypopygium in Fig.4 E. Anal point absent. Ninth tergite without long setae in the

middle portion, slightly produced in the middle. Inner lobe of gonocoxite small, longer than wide and with rounded margin. Gonostylus peculiar to this species, widest at base and tapering towards narrow, rounded and darkly pigmented apex, without apical spine and with a long curved seta and two shorter setae in the apical portion. Virga present.

*Remarks* : This species was described by SASA (1983, p.78) by males emerged from a bottom sample collected at Station No.1, the uppermost mountain stream running into the River Tama. Males and females of the same species were collected also from a small stream running into Lake Chuzenji, by SASA (1985, p.86).

### **37. *Limnophyes tamakitanoides* SASA, 1981**

(Figs.5 a-i)

Large number of males were collected on the bank of the Itachigawa, either resting in bushes or swarming in the air. Male : 1 at No.1, 1 at No.3, 1 at No.4, on 5 November 1985, 112 at No.2 (swarming in the air), 2 at No.3, 6 at No.4, 1 at No.5, 1 at No.6. Female : 1 at No.1, 1 at No.6, 1 at No.7, all 16 April 1986.

*Male* : Body length 2.28-2.90 (2.67 in average of 20 specimens), wing length 1.38-1.79 (mean 1.58) mm. Scutum, scutellum and postnotum entirely black, halteres dark brown, abdominal tergites dark brown, femora and proximal half of tibiae dark brown, distal half of tibiae and all tarsi brown. Eyes bare, reniform and widely apart from each other, ER 1.50-1.91 (1.65). Antenna with 13 flagellar segments, AR 0.89-1.12 (1.02), AHR 0.47-0.56 (0.51). so 1 or 2 in median and 3-5 in lateral frontal areas, cl 8-18 (12.9). Anteprepronotum (Fig.5 b) black, narrow but united in the middle, with 1 or 2 dorsal and 2, 3 or 4 lateral setae. Scutum and scutellum in Fig.5 a. Dorsomedians minute, 5-8 (6.8), arising in the middle portion of scutum. Dorsolaterals varying in number from 15 to 32 (mean 23.3), composed of long simple setae in the anterior and middle portion. and short, slightly lamellar setae in the posterior, prescutellar area. Prealar setae 5-9 (7.2). Scutellum with 6-8 (6.4) setae.

Wing membrane granular, slightly bluish. Squama with 2-7 (3.9) fringe hairs. Anal lobe obtuse. R2+3 separated, RR 0.34-0.42 (0.38). Costa extending much beyond end of R4+5, which is distinctly distal to end of Cul. fCu much beyond r-m, VR 1.20-1.31 (1.26). Anal vein ending below or proximal to fCu. Front tibia with a long terminal spur (58  $\mu$ , Fig. 4 c). Middle tibia with two short terminal spurs (both 20  $\mu$ , Fig.4 d). Hind tibia with a long terminal spurs (56  $\mu$ ), a short terminal spur (23  $\mu$ ), and a terminal comb composed of 12 free spurs 20-56 microns long (Fig.4 e,f). fLR 0.53-0.56 (0.54), mLR 0.48-0.52 (0.50), hLR 0.52-0.56 (0.54), fTR 0.11-0.13 (0.12), fBR 2.1-3.0 (2.4), mBR 2.2-3.3 (2.8), hBR 3.0-3.7 (3.4). Empodium much longer than claws, pulvilli absent (Fig.4 g). Distribution of setae on abdominal tergites in Fig.5 h.

Hypopygium in Fig.5 i. Anal point absent, ninth tergite with a pair of small tubercles in the middle of posterior margin, which bear numerous short setae and microtrichiae. Inner lobe of gonocoxite peculiar to this species, large, U-shaped in the cross section, and with rounded margin, bearing short setae and microtrichiae. Gonostylus nearly parallel-sided,





apically truncate, with a large apical spine but without subapical swelling.

*Remarks* : This species was described with a male and a female emerged in the laboratory from a bottom sample collected at Station No.6, the most polluted collection site of the Minamiasakawa River, Tokyo. Later, specimens of apparently the same species were collected with insect net on the shore of Lake Unagiike and Lake Fudo, southern Kyushu. In the present surveys, it was found to be distributed along wide ranges of the Stream Itachigawa, mainly in the less polluted, upstream parts. Especially noteworthy was the presence of large numbers of the adult males swarming on the bank of the stream in April. Morphologically, this species is characteristic in the presence of lamellar setae in the prescutellar area, and in the peculiar structure of inner lobe of gonocoxite, being U-shaped in the cross section.

**38. *Parakiefferiella itachiquarta*, sp. nov.**

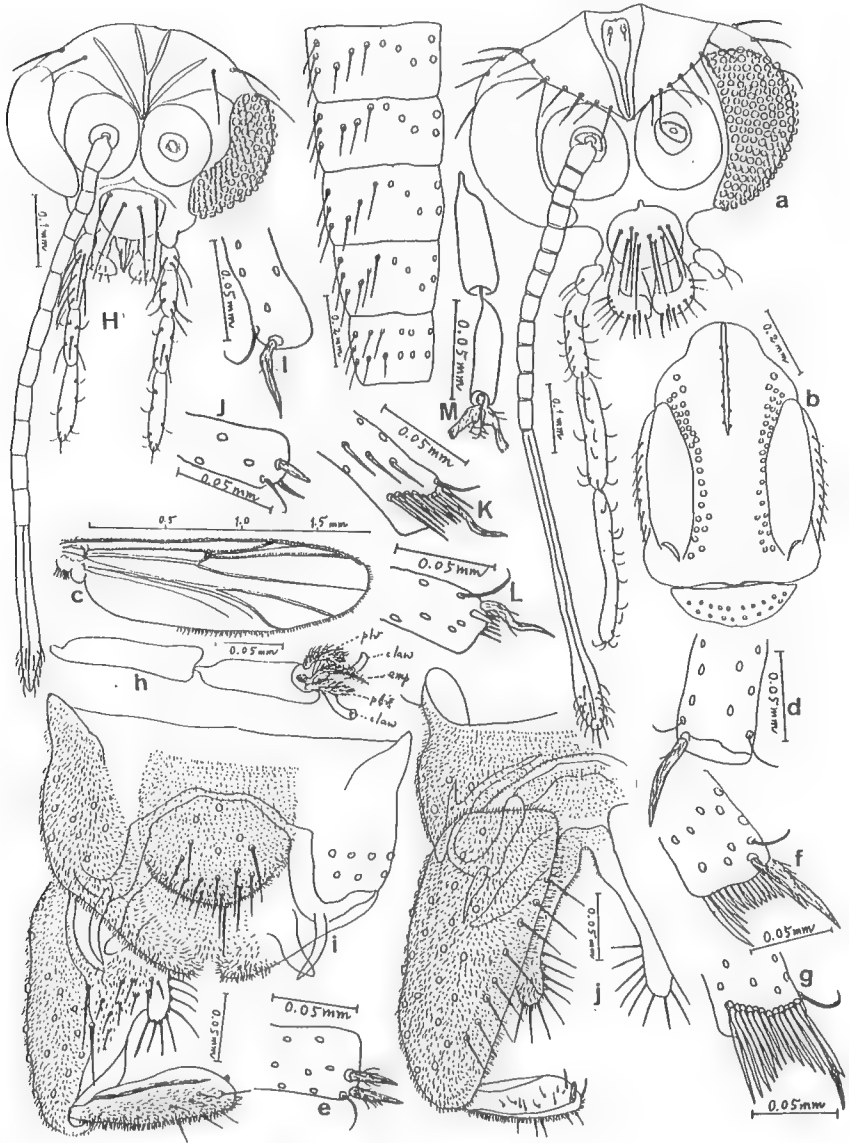
(Figs.5A-G, 6H-m)

Two males were collected at Station No.10 on 5 November 1985, with insect net from grasses on the bank near the mouth of the stream. Holotype : No.A 111 : 06 ; paratype : A 111 : 07.

*Male* : Body length 2.07, 2.14 mm, wing length 1.31, 1.38 mm. Ground color of scutum brown, scutal stripes dark brown, scutellum brown, postnotum black, leg segments yellowish brown, abdominal tergites yellowish brown. Head in Fig.6 H. Eyes bare, reniform and widely apart from each other, ER 1.44, 1.64. Antenna with 13 flagellar segments, AR relatively small, 0.44, 0.45, AHR 0.31, 0.34. so 3 : 4, 4 : 5, cl 4, 5. Anteprepronotum (Fig.5 A) very narrow and without lateral as well as dorsal setae. Scutum without dorsomedian setae, with a pale and granular area in the middle, with 5 : 6, 5 : 5 dorsolateral setae arising from large pale pits, and with 3 prealar setae on each side (Fig.5 B). Scutellar setae 2 in both specimens. Wing bare, brownish in color like in *Smittia* species, and quite smooth in appearance. Wing venation Fig.5 c, costa extending much beyond end of R4+5. R2+3 almost fused with R4+5, RR 0.92, 0.96. fCu much beyond r-m, VR 1.30, 1.35. Cu2 conspicuously curved in the middle. Anal vein extending beyond fCu. Squama without fringe hairs. Front tibia with a long terminal spur (36  $\mu$ , Fig.6 I). Middle tibia with two short terminal spurs (both 15  $\mu$ , Fig.6 j). Hind tibia with a long terminal spur (33  $\mu$ , Fig.6 K, L.), a short terminal spur (12  $\mu$ ), and a terminal comb composed of 8 or 9 free spurs (18-30  $\mu$ ). Tarsi I, II and III of middle and hind legs each with two short and weak terminal spurs. Pulvilli absent (Fig.6 M).

Abdominal tergites with highly reduced numbers of setae. Hypopygium in Figs.5 D, E. Anal point broad, roughly triangular but with rounded posterior margin, with two pairs of setae on the dorsal side. Inner lobe of gonocoxite composed of a thumb-like bare dorsal lobe, and a low, broad and setigerous ventral lobe (Figs.5 F,G). Gonostylus nearly parallel-sided, inner margin concave, without subapical swelling and with a strong apical spur.

*Remarks* : This species seems to belong to genus *Parakiefferiella* THIEMANN as redefined by BRUNDIN (1956, p.148), since eyes are bare and without dorsomedial projection,



**Fig.6.** *Parakiefferiella itachiquarta* sp. nov., male (continued). **H**: head. **I**: tip of front tibia. **J**: tip of middle tibia. **K**, **L**: tips of hind tibia. **M**: front tarsi IV and V. *Pseudorthocladius matusecundus*, sp. nov., male. **a**: head. **b**: scutum and scutellum. **c**: wing. **d**: tip of front tibia. **e**: tip of middle tibia. **f**, **g**: tips of hind tibia. **h**: front tarsi IV and V. **i**: hypopygium, dorsal view. **j**: ditto, ventral view.

antenna expanded apically and with numerous sensory setae but without apical spur, dm absent, dl and sc reduced in numbers, setae on abdominal tergites also highly reduced, wing bare, costa extending beyond end of R4+5, Cu2 strongly curved, pulvilli absent, and anal point broad and low, with two setae on both sides. Among the known species of this genus, it seems to be most closely related to *P.coronata* (EDWARDS, 1929), which was described by the original author by the name of *Spaniotoma (Eukiefferiella) coronata* and redescribed by PINDER 1978, p.92) as a member of *Parakiefferiella*, especially in that anal point is broadly rounded. However, according to EDWARDS (1929, p.354), Cu2 is almost straight (strongly bent in the present species), and apical pubescence is confined to extreme tip of antenna (apical pubescence extends more extensively in the present species). In such a sense, the present species is more closely related to *Spaniotoma (Eukiefferiella) camptophleps* EDWARDS, 1929 (p.353). However, according to PINDER (1978, p.86), this species is a member of genus *Krenosmittia* THIENEMANN in the present concept, since anal vein is ending well proximal to fCu (extending beyond fCμ in the present species), and inner lobe of gonocoxite is expanded distally (it is double and not distally expanded in the present species).

Five species of genus *Parakiefferiella* have been recorded from Japan and the adjacent areas, and they may be differentiated in males by the following key.

**Key to males of *Parakiefferiella* recorded from Japan**

- 1— Gonostylus tapering and sharply pointed apically ; Cu2 almost straight and slightly undulated apically ; abdominal tergites each with a narrow dark band on caudal margin ; AR about 1 ; inner lobe of gonocoxite very broad and with rounded caudal margin ; body length about 3 mm (after TOKUNAGA, 1940, p.288)  
*tipuliformis* (TOKUNAGA)
- Gonostylus not tapering but truncate apically ; Cu2 strongly curved at about middle ; abdominal tergites without caudal dark band ; AR 0.85 or less, BL 2.2 mm or less, WL 1.5 mm or less  
2
- 2— Gonostylus apically expanded and abruptly curved inwards ; anal point nearly rectangular ; inner lobe of gonocoxite simple, broad and rectangular ; WL 1.34--1.43, AR 0.67-0.69  
*chuzeundecima* (SASA)
- Gonostylus not expanded and only slightly curved apically  
3
- 3— Anal point broadly rounded ; inner lobes of gonocoxite double, the dorsal lobe narrow, rounded and bare, the ventral lobe broad, low and setigerous ; virga very long ; BL 2.07-2.14 mm, WL 1.31-1.38 mm, AR 0.44-0.45 ; R2+3 ending close to end of R4+5, RR 0.92-0.96  
*itachiquarta*, n. sp.
- Anal point triangular ; inner lobe of gonocoxite single ; virga 4 shorter
- 4— Scutum with a conspicuous spine clusters behind median stripe ; AR 0.38-0.48 ; R2+3 ending close to end of R4+5 ; body coloration yellow, with brown marks ; BL 1.62-1.90 mm, WL 1.05-1.18 mm  
*tamatriangulata* SASA

—Scutum without conspicuous spine clusters; R2+3 ending about midway between ends of R4+5, RR 0.46-0.48; AR 0.71-0.85; Body coloration brown, with dark brown marks; BL 2.03-2.14 mm, WL 1.38-1.48 mm

*bathophila* (KIEFFER) sensu SASA(1985b,p.60)

**39. *Parametriocnemus stylatus* (KIEFFER, 1924)**

(Figs.12 A-D)

Two males were collected on 16 April 1986, one at No.2, another at No.4 (No.A 116 : 86, 87)

*Male* : BL 3.28, 3.41 mm, WL 1.90, 2.00 mm. Body largely brown; ground color of scutum yellow, stripes reddish brown, scutellum brown, postnotum dark brown, abdominal tergites brown; legs yellowish brown. Head in Fig.12 A. Eyes each with a long and narrow dorsomedial projection, ER 0.42, 0.44 (unusual as a member of Orthocladiinae, which usually show ER larger than 1.0). Antenna with 13 flagellar segments, AR 1.11, AHR 0.50 (both antennae are lost in one specimen), last segment swollen apically and with long curved sensory setae (Fig.12 B); supraorbital setae 11 : 11, 11 : 11, clypeal setae 12,15. Anteprenotum (Fig.12 C) well developed, united in the middle, with 6 : 6, 8 : 8 lateral setae. dm 17, 20, in two rows, all minute, arising at some distance from anterior end of scutum. dl 18 : 23, 18 : 22, all strong and arising from large pale pits. pa 5 : 6, 6 : 6. sc 10, 11. Wing membrane slightly brownish, with numerous macrotrichiae on distal and posterior half, R2+3 nearly fused with R4+5, RR 0.77, 0.79. Costa extending much beyond end of R4+5. VR 1.10, 1.14. Cul ending slightly proximal to end of R4+5. Cu2 strongly curved at about distal 1/3. Anal vein extending much beyond fCu. fLR 0.74, 0.75, mLR 0.57, 0.58, hLR 0.61, 0.62, fTR 0.12, 0.13, fBR 2.5, 2.7, mBR 2.7, 3.1, hBR 3.5, 3.6. Tarsi IV longer than tarsi V in all legs, pulvilli absent.

Hypopygium in Fig.12 D. Ninth tergite with a long and stout anal point, which is widest at base and apically rounded, with two short lateral setae on each side and numerous microtrichiae on basal half, distal half bare. Inner lobes of gonocoxite composed of a rectangular dorsal lobe, and an obtuse and broad ventral lobe. Gonostylus widest at the truncated apex, with a strong apical spur and a small subapical swelling.

*Remarks* : This is a species known to be widely distributed in Europe, and was recorded also by TOKUNAGA (1939, p.307) from Kyoto. SASA (1981, p.25, 99) recorded male, female, pupa and larva of this species collected from the less polluted, upper parts of the Tama River. The present specimens were collected also from the upper, less polluted parts of this stream.

**40. *Pseudorthocladius matusecundus*, sp. nov.**

(Figs. 6 a-j)

A male was collected at D on 24 May 1983 (A 107 : 31).

*Male* : Body length 3.28 mm, wing length 1.83 mm. Ground color of scutum dark brown, scutal stripes, scutellum and postnotum black, adomonal tergites dark brown. Front femur yellow on ventral side of distal half, other leg parts entirely dark brown. Heads in Fig.6 a.

Eyes bare, inner margin conspicuously concave, ER 1.03. Antenna with 13 flagellar segments, AR 1.09, AHR 0.59, last segment swollen apically and bearing numerous short and curved sensory setae in the distal part. Palp relatively long, 4 segmented (54, 144, 166, 226  $\mu$ ). so 10 : 10, cl 10. Scutum and scutellum in Fig.6 b. Dorsomedian setae 12, all minute. Dorsolateral setae 30 : 30, each arising from a large pale pit. Prealar setae 8 : 8, scutellar setae 18 in double rows.

Wings in Fig.6 c. Squama with 18 : 18 fringe hairs. Membrane bare, nearly smooth, brownish in transmitted light. Costa extending much beyond end of R4+5. R2+3 ending about midway between ends of R1 and R4+5, RR 0.56. fCu slightly beyond r-m, VR 1.17. Cu2 conspicuously sinuate. Anal vein extending much beyond fCu. Front tibia with a long terminal spur (56  $\mu$  ; Fig.6 d). Middle tibia with two short terminal spurs (30, 33  $\mu$  ; Fig.6 e). Hind tibia with a long terminal spur (66  $\mu$  ; Figs.6 f, g), a short terminal spur (28  $\mu$ ), and a terminal comb composed of 14 free spurs (28-44  $\mu$  ; Fig.6 g). Tarsi without terminal spurs. All legs with a pair of large pulvilli (Fig.6 h).

Hypopygium in Figs.6 i, j. Ninth tergite without anal point, with a large, wide and round lobe with darkly pigmented posterior margin, bearing strong setae. Inner lobe of gonocoxite small, with rounded margin, and bearing 8 long and stout marginal setae. Gonostylus simple, inner margin convex and widest at about distal 1/3, with an apical spur and two accessory apical setae.

*Remarks* : This species is placed in the genus *Pseudorthocladus* GOETGHEBUER 1932 in the sense of BRUNDIN (1956, p.137), PINDER (1978, p.50) and SAETHER & SUBLETTE (1983, p.46), since eyes and wings are bare, squama fringed, scutum with large numbers of dorsolateral and prealar setae, costa produced, Cu2 curved, ninth tergite with a wide and rounded lobe bearing strong setae in the middle, and gonostylus is simple. Among the known species of this genus, it seems to be most closely related to *P.filiformis* (KIEFFER, 1908), in the sense of SAETHER & SUBLETTE (1983, p.61), in that thorax is almost entirely black, AR about 1.0, and anal lobe is wide and rounded, but differs essentially from this species in that anal lobe of ninth tergite is much wider and lower, inner lobe of gonocoxite is smaller, narrower and bearing long setae on inner margin, and gonostylus is expanded near apex and with strongly convex inner margin.

**41. *Pseudosmittia itachisecunda*, sp. nov.**

(Fig. 7 a-l)

4 males were collected at Station 1 on 16 April 1986. Holotype : A 113 : 01. Paratypes : A 113 : 02A, 03A, 04B.

*Male* : Body length 3.34-3.66 (3.55 in average of 4) mm, wing length 2.07-2.48 (2.12) mm. Body almost uniformly black. Head in Fig.7 a. Eyes reniform and without dorsomedial projection, widely apart from each other, ER 1.44-1.77 (1.61). Antenna (Fig.7 i) with 13 flagellar segments, AR relatively high, 2.07-2.21 (2.15), AHR 0.57-0.61 (0.58), so 4 or 6 (4.9) on each side, cl 6, 7 or 8. Antepnotum (Fig.7 b) much reduced, only narrowly united in the

middle, with 1 or 2 lateral setae. Scutum and scutellum in Fig.7 d. dm absent, dl 6-9 (7.9), pa 3-5 (4.1). Scutal tubercle (Mesonotalhöcker of BRUNDIN, 1956, p.166) present. Scutellar setae 7-13 (10.7). Wing in Fig.7 c. Wing membrane bare, brownish in color, quite plain. Anal lobe rectangularly produced. Costa not extending beyond end of R4+5. RR 0.42-0.47 (0.44), VR 1.21-1.26 (1.24). Cu2 conspicuously bent in the middle. Anal vein extending beyond fCu, but not reaching to wing margin.

Front tibia with a long terminal spur (64  $\mu$ , Fig.7 e). Middle tibia with two short terminal spurs (both 22  $\mu$ , Fig.7 f). Hind tibia with a long terminal spur (52  $\mu$ ), a short terminal spur (25  $\mu$ ), and a terminal comb composed of 13 free spurs (24-42  $\mu$ , Fig.7 g). All tarsi without terminal spurs. fLR unusually small, 0.43-0.45 (0.44), mLR 0.46-0.50 (0.48), hLR 0.47-0.52 (0.50), fTR 0.10-0.11 (0.10). Tarsi with relatively long beards, fBR 2.8-3.1 (3.0), mBR 3.3-3.5 (3.4), hBR 4.0-5.3 (4.8). All legs with well developed claws, empodium, and with a pair of small pulvilli (Fig.7 h). Abdominal tergites with relatively numerous setae (Fig.7 j).

Hypopygium in Figs.7 k, l. Ninth tergite without anal point, but with a broad and rounded process on the posterior margin bearing numerous short setae, and a longitudinal hell groove in the middle. Gonocoxite with two large inner lobes, the dorsal lobe rectangular and bearing short setae but without microtrichiae, and the ventral lobe which is low, broad and thickly covered with microtrichiae. Gonostylus simple, widest at apex, inner margin almost straight, and with a large apical spur. Virga present, composed of numerous short, rigid and darkly pigmented spines.

*Remarks* : This is provisionally placed to the genus *Pseudosmittia* GOETGHEBUER, since eyes, wing membrane and squama are all bare, antenna without apical seta and with sensory setae in the distal portion of the last segment, scutal tubercle (Mesonotalhöcker of BRUNDIN, 1956, p.166) present, scutum without dorsomedian setae, dorsolateral setae well developed and each arising from a large pale pit, costa not produced beyond end of R4+5, R2+3 separated from R1 and R4+5, anal vein does not reach to the wing margin, anal point absent, and gonostylus is simple. However, the present species does not fit to the key characters of this genus as proposed by BRUNDIN (1956, P.165) and PINDER (1978, p.50), differs from all the previously known species of this genus in that R4+5 ending above tip of Cul (Fig.7 c), and pulvilli are present though very small. It also differs from members of genus *Acamptocladius* BRUNDIN in that tarsi V are not dorsoventrally flattened but are cylindrical as usual, and from *Camptocladius* van der Wulp in that anal vein dose not reach to wing margin.

#### 42. *Pseudosmittia itachibifurca*, sp. nov.

(Figs. 7 A-I, 8 J)

A male was collected at No.2 on 16 April 1986 (No.A 115 : 03).

*Male* : Body length 1.66 mm, wing length 1.06 mm. Ground color of scutum brown, stripes, scutellum and postnotum dark brown, halteres yellow, abdominal tergites dark brown, intersegmental membrane pale, sternites yellowish brown; leg segments largely yellow. Eyes bare, reniform, ER 1.56. Antenna with 13 flagellar segments, AR 0.78, AHR

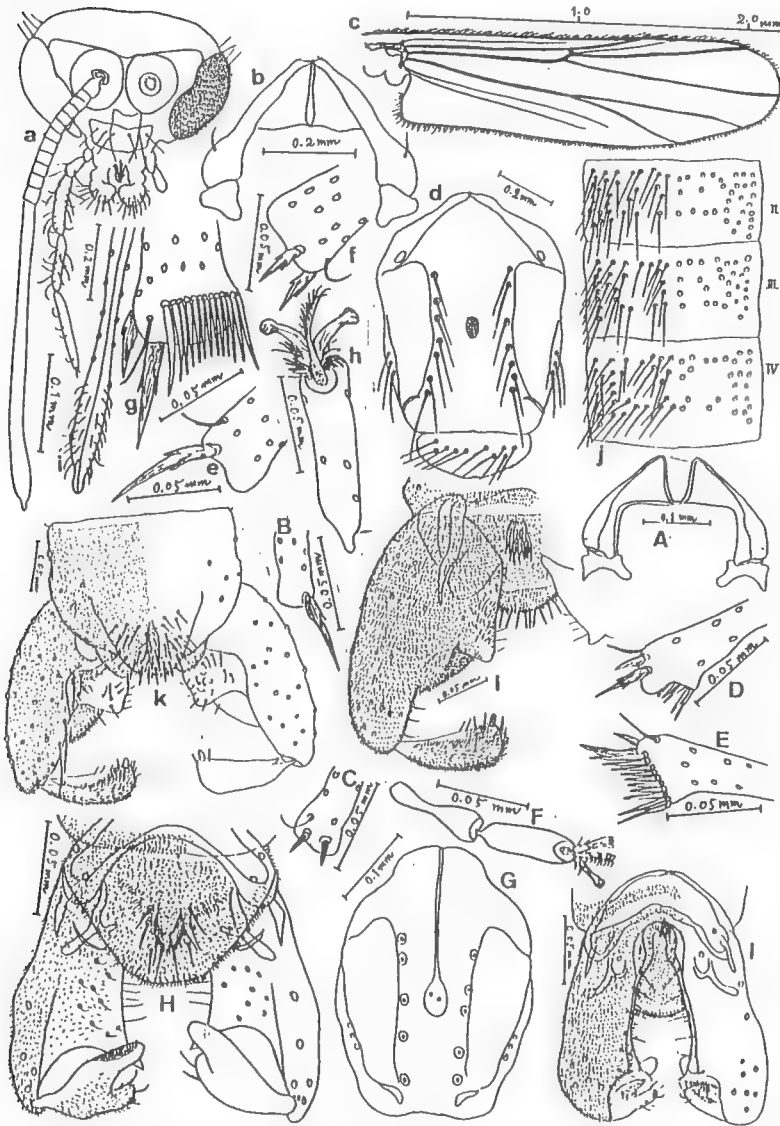
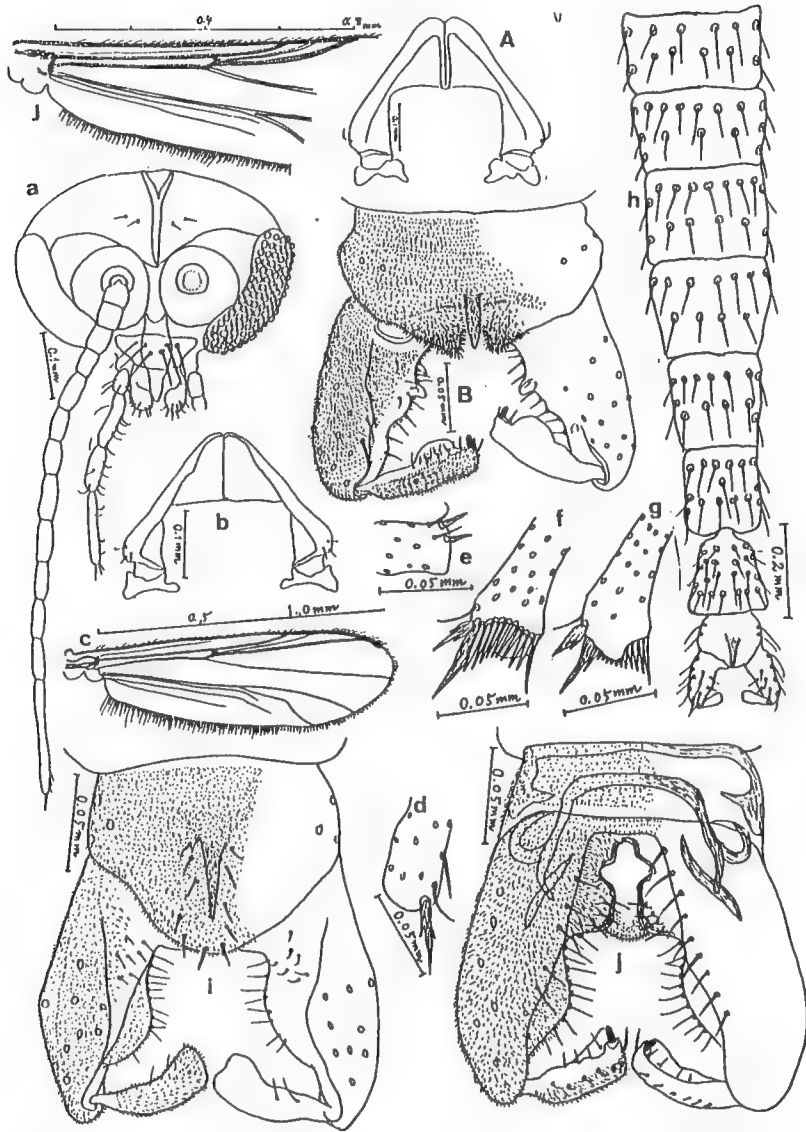


Fig.7. *Pseudosmittia itachisecunda*, sp. nov., male. a : head. b : antepronotum. c : wing. d : scutum and scutellum. e : tip of front tibia. f : tip of middle tibia. g : tip of hind tibia. h : front tarsus V. i : tip of antenna. j : abdominal tergites II to IV. k : hypopygium, dorsal view. l : hypopygium, ventral view.

*Pseudosmittia itachibifurca*, sp. nov., male. A : antepronotum. B : tip of front tibia. C : tip of middle tibia. D, E : tips of hind tibia. F : hind tarsi IV and V. G : scutum and scutellum. H : hypopygium, dorsal view. I : hypopygium, ventral view.





**Fig.8.** *Pseudosmittia itachibifurca*, sp. nov., male (continued). **J**: basal portion of wing. *Smittia aterrima* (MEIGEN), male. **A**: anteprenotum. **B**: hypopygium. *Smittia itachinudiocula*, sp. nov., male. **a**: head. **b**: anteprenotum. **c**: wing. **d**: tip of front tibia. **e**: tip of middle tibia. **f**, **g**: tips of hind tibia. **h**: abdominal tergites II-IX and hypopygium. **i**: hypopygium, dorsal view. **j**: hypopygium, ventral view.

0.45, last antennal segment not apically expanded, with a terminal seta and numerous short sensory setae in the apical portion. so 4 : 4, cl 2. Antepronotum narrow and widely separated in the middle, with only one lateral seta (Fig.7 A). Scutum and scutellum in Fig. 7 G. Scutum with a pale, granular area in the center (Mesonotalhöcker of BRUNDIN, 1956, p.166), without dorsomedian setae, with 5 : 5 dorsolateral setae all arising from a large pale pit, and 3 : 3 prealar setae. Scutellar setae 4. Wing (part) in Fig.8 J. Squama bare. R2+3 ending about midway between ends of R1 and R4+5, RR 0.54. R4+5 ending far proximal to tip of wing (such as in *Eukiefferiella coerulea* of the present paper). fCu much beyond r-m, VR 1.37. Wing membrane bare, very finely granular, slightly brown. Front tibia with a long terminal spur (36  $\mu$ , Fig.7 B). Middle tibia with two short terminal spurs (12, 13  $\mu$ , Fig.7 C). Hind tibia with a long terminal spur (32  $\mu$ ), a short terminal spur (12  $\mu$ ), and a terminal comb composed of 11 free spurs (16-28  $\mu$ , Figs.7 D, E). fLR unusually small, 0.38, mLR 0.46, hLR 0.52, fTR 0.14, fBR 3.0, mBR 4.0, hBR 4.6. Tarsi IV shorter than tarsi V, 44 and 50  $\mu$  in the front leg, 46 and 52  $\mu$  in the middle leg, and 50 and 53  $\mu$  in the hind leg (Fig.7 F). Claws and empodium well developed, pulvilli absent. All tarsal segments without terminal spurs.

Hypopygium in Figs.7 H, I. Anal point situated roughly in the center of ninth tergite, crescent-shaped in appearance, darkly pigmented, with numerous microtrichiae and 4 simple setae. Ninth tergite with 6 short setae at the base of anal point. Inner lobe of gonocoxite roughly rectangular. Gonostylus peculiar to this species, apically forked into two arms with U-shaped groove between them, the inner arm longer and bearing rectangular apical process, the outer arm apically rounded and bearing 5 setae subapically. Small virga present.

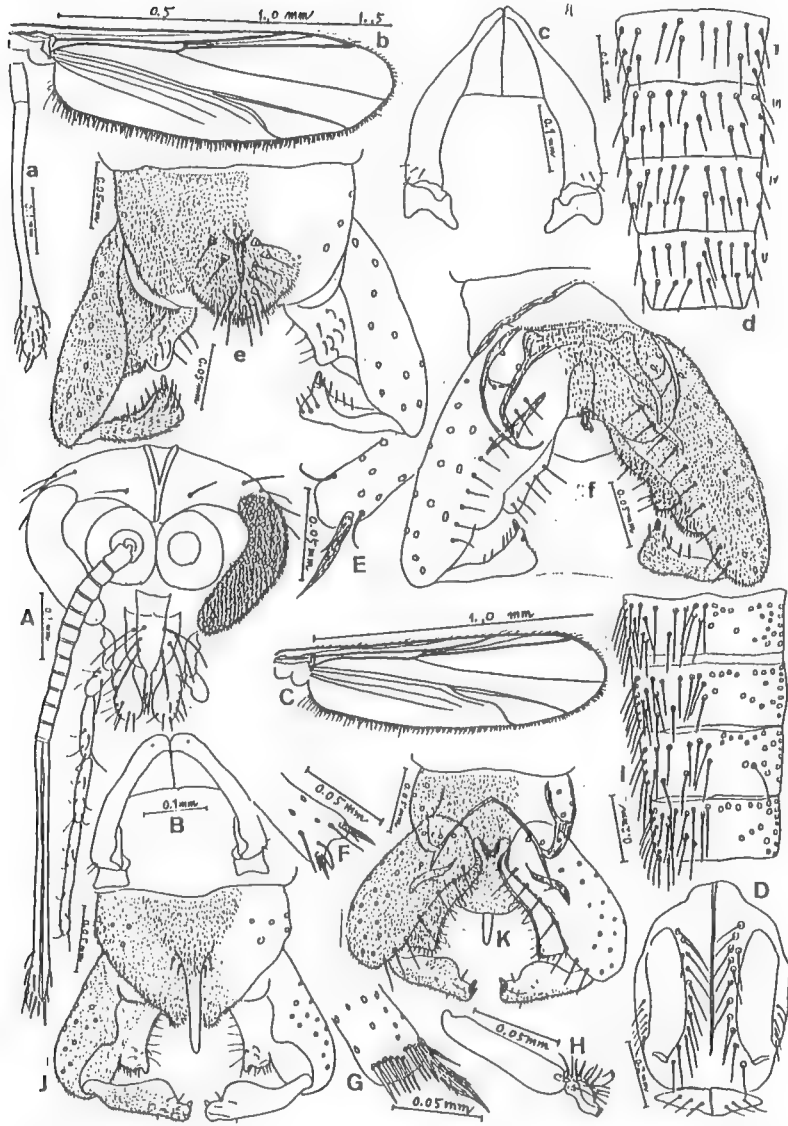
*Remarks* : This species is tentatively placed in the genus *Pseudosmittia* GOETGHEBUER, since anal point is short, pubescent and situated in the middle of ninth tergite, wing membrane is very finely granular, R4+5 being very short and ending much proximal to end of Cul, dorsomedian setae absent, scutum with a central pale area (Mesonotalhöcker), eyes are reniform and bare, and antenna composed of 13 flagellar segments as usual. However, it differs from all the previously known species of this genus in that gonostylus is forked into two arms, such as seen in *Tokunagayusurika*, and squama is bare. Therefore, it probably represent a new genus.

#### 43. *Smittia aterrima* (MEIGEN, 1818)

(Figs. 8 A-B)

A total of 42 males were collected with insect net on the shore of the Itachigawa on 5 November 1985, 3 at No.1, 3 at No.2, 24 at No.3 (swarming), 1 at No.5, 1 at No.7, 2 at No. 8, 5 at No.9, and 3 at No.10. On 16 April 1986, a total of 48 males were collected also with insect net, 2 at No.1, 32 at No.2 (swarming), 9 at No.3, 3 at No.4, 1 at No.6, and 1 at No.7.

*Remarks* : This species is distributed widely in Europe, and was recorded by TOKUNAGA (1940, p.289) from Omu (Hokkaido), by SASA (1985, p.121) from Lakes Motosu and Yamanaka (Yamanashi), by SASA & KAMIMURA (in press) from Akan (Hokkaido), and by SASA & KAWAI (1987) from Lake Biwa (Shiga). The structure of hypopygium and antepronotum is in Figs.



**Fig.9.** *Smittia itachituberculata*, sp. nov., male. **a**: antenna, last and penultimate segments. **b**: wing. **c**: antepronotum. **d**: abdominal tergites II to V. **e**: hypopygium, dorsal view. **f**: hypopygium, ventral view. *Smittia itachipennis*, sp. nov., male. **A**: head. **B**: antepronotum. **C**: wing. **D**: scutum and scutellum. **E**: tip of front tibia. **F**: tip of middle tibia. **G**: tip of hind tibia. **H**: hind tarsus V. **I**: abdominal tergites II to V. **J**: hypopygium, dorsal view. **K**: hypopygium, ventral view.

8 A, B.

**44. *Smittia itachinudiocula*, sp. nov.**

(Figs. 8 a-j)

A male was collected on the shore of the Itachigawa at Station No.4 (No. A 115 : 08).

*Male* : Body length 1.90 mm, wing length 1.42 mm. Body almost uniformly dark brown, legs brown, scutal stripes black. Head in Fig.8 a. Eyes bare, inner margin only slightly concave and widely separated from each other, ER 1.75. Antenna with 13 flagellar segments, last segment very short, AR 0.29. Antennal hairs relatively short, AHR 0.31. Palp with 4 flagellar segments, 36, 80, 73, 92  $\mu$ . Supraorbital setae 2 pairs in the middle and 3 pairs behind eyes. Antepronotum narrow, tapering towards middle and narrowly connected with each other, with 3 : 3 lateral setae (Fig.8 b). dm absent, dl 8 : 8, all arising from a large pale pit, pa 3, 3. Scutellum with only 4 setae. Wing membrane bare, smooth and brown in color. Squama bare, anal lobe obtuse. Wing venation in Fig.8 c. Costa extending much beyond end of R4+5. R2+3 ending closer to end of R1 than to end of R4+5, RR 0.36. fCu much beyond r-m, VR 1.38. R4+5 ending slightly beyond end of Cu1. Cu2 strongly curved. Anal vein extending beyond fCu. Front tarsus I relatively short, fLR 0.42, mLR 0.48, hLR 0.49, fTR 0.11, fBR 3.1, mBR 4.0, hBR 4.4. Front tibia with a long barbed spur (35  $\mu$ , Fig.8 d). Middle tibia with two short spurs (Fig.8 e). Hind tibia expanded apically and with a posterior projection, with a long terminal spur (41  $\mu$ ), a short terminal spur (18  $\mu$ ), and a terminal comb composed of 10 free spurs 20-32  $\mu$  long (Figs.8 f, g). Pulvilli absent.

Abdominal tergites with highly reduced numbers of setae (Fig.8 h). Hypopygium in Figs.8 i, j. Ninth tergite with rounded posterior margin, with a short, narrow and darkly pigmented anal point in the middle, which is covered with microtrichiae towards the tip, and with 12 short setae in two longitudinal rows in the middle. Gonocoxite with two inner lobes, the basal lobe being nearly quadrangular, and the distal lobe being broad and rounded, both bearing numerous microtrichiae and many short and strong setae (Fig.8 j). Gonostylus expanded towards the tip, and with a strong apical spur.

*Remarks* : This species is morphologically quite characteristic and can be easily differentiated from other previously known members of genus *Smittia* in that eyes are bare, antenna with 13 flagellar segments as usual but with extremely small AR, and with two inner lobes on gonocoxite. All the *Smittia* species previously known from Japan have pubescent eyes excepting two marine species, *S. bifurcata* TOKUNAGA and *S. littoralis* TOKUNAGA, and with only one inner lobe on gonocoxite. Among the European species of this genus, it is somewhat related to *S. aterrima* (MEIGEN) in that anal point is short and entirely covered with microtrichiae, but in this species the anal point is colorless and faint, inner lobe of gonocoxite is small and single, and eyes are pubescent. TOKUNAGA (1964) recorded 17 species of genus *Smittia* from Micronesia, among which the present species is somewhat related to *S. tuberculifera* TOKUNAGA in that eyes are bare, costa produced beyond end of R4+5, scutum black, and AR being relatively small, but both differ essentially in the structure of inner lobe of

gonocoxite, in the shape of anal point, and in the shape of gonostylus.

**45. *Smittia itachituberculata* sp. nov.**

(Figs. 9 a-f)

Two males were collected on the bank of the Itachigawa by sweeping with insect net on 16 April 1986, one at Station 4 (holotype, A. 115 : 06), another at Station 5 (paratype, A 115 : 07).

*Male* : Body length 2.24, 2.35 mm, wing length 1.60 mm (wing broken in the paratype). Body largely dark brown or black, i.e. scutum, scutellum and postnotum black, proximal leg segments dark brown, tarsi brown, abdominal tergites dark brown. Eyes bare as in the last species (eyes are pubescent in all the previously known non-marine *Smittia* of Japan), roughly reniform and inner margin almost straight, widely separated from each other, ER 1.32, 1.49. Antenna with 13 flagellar segments, AR 0.69, 0.78, AHR 0.44, last segment swollen apically, with an apical spur, and numerous subapical sensory spines (Fig.9 a). Supraorbital setae 6 : 6, 8 : 8, clypeal setae 8 : 10. Anteprenotum (Fig.9 c) well developed and with 3 : 3, 4 : 4 lateral setae. Scutum with no dm, 8 : 9, 9 : 8 dl, and 3 : 3, 3 : 3 pa. Scutellar setae 6 in both specimens. Wing in Fig.9 b. Squama with no fringe seta. Anal lobe more produced than in the preceding species. Costa not extending beyond end of R4+5. R2+3 separated, RR 0.29. fCu much beyond r-m, VR 1.30, 1.32. Vein Cu2 strongly sinuate. The structure of leg segments as in other *Smittia* species, fLR 0.47, 0.49 (unusually small), mLR 0.48, 0.48, hLR 0.50, 0.50, fTR 0.12, 0.13. Tarsal beards medium in length, hBR 4.3. Front tibia with a long terminal spur (45  $\mu$ ); middle tibia with two short terminal spurs (22 and 25  $\mu$ ); hind tibia with a long terminal spur (38  $\mu$ ), a short terminal spur (21  $\mu$ ), and a terminal comb composed of 13 free spines (20-36  $\mu$ ). Claws and empodium well developed, pulvilli absent.

Abdominal tergites with reduced numbers of setae (Fig.9 d). Hypopygium in Figs.9 e, f. Ninth tergite with a narrow and apically pointed anal point entirely covered with microtrichiae (anal point is transparent and easily overlooked, such as in *Smittia aterrima*), and 11-13 short setae in the middle, among which 6 in the distal area arise from conspicuous tubercles. Inner lobe of gonocoxite small and with rounded margin. Gonostylus without subapical swelling, inner margin concave, widest at apex and with truncate distal margin, and with conspicuous apical spur. Small virga present.

*Remarks* : This is another new Japanese *Smittia* species with non-pubescent eyes, but can be easily differentiated from the preceding species by the larger value of AR, by the shape of anal point, and by having conspicuous tubercles on ninth tergite at the base of setae. The present species is also somewhat related to *S. contingens* (WALKER) recorded from Europe in that gonostylus has no subapical swelling, but both differ essentially in the shape of inner lobe of gonocoxite, anal point, and gonostylus.

**46. *Smittia itachipennis*, sp. nov.**

(Figs. 9 A-K)

A total of 60 males were collected on the shore of the Itachigawa on 5 November 1985,

2 at Station No.1, 1 at No.2, 4 at No.3, 8 at No.5A, 8 at No.5, 34 at No.6, 2 at No.7, and 1 at No.8. Altogether 67 males were collected also on 16 April 1986, 3 at No.1, 16 at No.2, 35 at No.3, 22 at No.4, 3 at No.5, 4 at No.6, and 3 at No.7; a female was collected at No.1, and 2 females at No.6.

*Male*: Body length 2.14-2.34 (2.27 in average of 10) mm, wing length 1.38-1.52 (1.45) mm. Body almost uniformly black or dark brown, i.e. scutum black and stripes hardly distinguishable, scutellum also black, abdominal tergites dark brown, femora dark brown, tibiae and tarsi brown, wing unmarked. Head in Fig.9 A. Eyes highly pubescent, inner margin concave, ER 1.17-1.43 (1.30). Antenna with 13 flagellar segments, AR 1.31-1.51 (1.40), AHR 0.48-0.59 (0.54), last segment slightly swollen apically, with a strong apical seta 26-29 microns long. Supraorbital setae 1-3 in the inner region and 4 or 5 in the lateral region, 5-8 (mean 5.6) in total on one side. cl 7-12 (most frequently 8, mean 8.7). Antepronotum (Fig.9 B) well developed, united in the middle, dorsal setae absent (pale pit often present), lateral setae 0, 1, or 2 (0.8 in average). Scutum and scutellum in Fig.9 D; dm 3-7 (4.3), all minute and from small pits; dl 9-13 (11.6), all long, stout and arising from large pale pits; pa 4, 5 or 6 (4.9); sc 6 in all specimens examined.

Wing in Fig.9 C. Squama bare. Anal lobe obtuse. Wing membrane smooth, slightly brown. R2+3 separated from R1 and R4+5, ending closer to end of R1 than to end of R4+5, RR 0.29-0.39 (0.33). Costa extending much beyond end of R4+5. fCu much beyond r-m, VR 1.29-1.38 (1.33). R4+5 ending above tip of Cu1. Cu2 strongly sinuate. Anal vein much extending beyond fCu. Terminal structure of tibiae similar to most other Orthocladiinae, front tibia with a long terminal spur (Fig.9 E), middle tibia with two short terminal spurs (Fig.9 F), hind tibia with a long and a short terminal spur and a terminal comb composed of 11 free spurs (Fig.9 G). fLR 0.51-0.55 (0.53), mLR 0.43-0.45 (0.44), hLR 0.53-0.57 (0.55), fTR 0.11-0.13 (0.12), fBR 3.0-5.2 (3.7), mBR 3.3-6.0 (4.5), hBR 3.8-6.5 (5.5). Tarsus V without pulvilli, claws with forked tip and strong basal setae, empodium well developed (Fig.9 H).

Abdominal tergites with rather reduced numbers of setae (Fig.9 I). Hypopygium in Figs. 9 J, K. Ninth tergite with 2 or 3 short setae on both sides of base of anal point. Anal point very long, widest at base and with rounded apex, with microtrichiae at base but otherwise bare, tip exceeding far beyond posterior margin of ninth tergite. Inner lobe of gonocoxite broad, posterior margin almost rectangular or with a small hook. Gonostylus simple, with a strong apical spur, inner margin broadly swollen. Ninth sternite with a low conical process in the middle between bases of gonocoxite, which is darkly pigmented and with short, strong setae (Fig.9 K).

*Remarks*: This species was collected in large numbers while swarming or resting on the shore of the Itachigawa, both in November and April. Morphologically, it belongs to the group B of genus *Smittia* in the sense of EDWARDS (1929, p.360), since anal vein is reaching beyond fCu and curved down at tip and not reaching wing margin, the body is entirely black, and pulvilli are absent. In the key prepared by PINDER (1978), it comes out to *S. pratorum*

(GOETGHEBUER, 1926), since gonostylus has a conspicuous subapical swelling, AR is smaller than 2.0, anal point is long and its apical half is bare, and R4+5 is ending above tip of Cu1. However, according to EDWARDS (1929, p.361) and GOETGHEBUER (1940, p.97), the eyes of this species are not pubescent but bare, and thus essentially different from the present species. It is also closely related to *S. nudipennis* (GOETGHEBUER, 1913) in that anal point is very long and its distal half is bare, but in this species AR is smaller (1.0-1.2), anal lobe of wing is absent, and R4+5 is ending proximal to tip of Cu1, according to PINDER (1978, p.96), and thus also different from the present species.

***Toyamayusurika*, gen. nov.**

Type species. *Toyamayusurika shiotanii*, sp. nov.

Diagnostic characters : Separable from other Orthocladiinae by that gonostylus is roughly V-shaped by having an unusually long basolateral process, otherwise more or less related to the species of *Pseudorthocladus* GOETGHEBUER in having a triangular anal point bearing short, strong, simple setae, with a pair of large pulvilli on all legs, Cu2 is only slightly curved, and wing membrane has finely granular appearance.

**47. *Toyamayusurika shiotanii*, gen. nov., sp. nov.**

(Figs. 10 a-l)

Two males were identified among the adult midges collected at Station 4 on 16 April 1986. Holotype : A 105 : 01 ; paratype : A 105 : 02.

*Mele* : Body length 2.76, 2.83 mm, wing length 1.55, 1.59 mm. Ground color of scutum dark brown, scutal stripes black, scutellum brown and with black edges, postnotum black, leg segments dark brown, abdominal tergites dark brown, hypopygium black.

Head in Fig.10 a. Eyes bare, without dorsomedial projection, inner margin slightly concave, ER 1.24, 1.30. so 12 : 12, cl 8, 10. Anteprepronotum (Fig.10 b) well developed, broadly united in the middle, with 9 : 10, 10 : 10 lateral setae but without dorsal setae. Scutum and scutellum in Fig.10 d. Dorsomedian setae 18, 20, all minute and roughly in two longitudinal rows. Dorsolaterals 24 : 25, 29 : 29, each arising from a large pale pit, composed of the long (120 microns) and the short (40  $\mu$ ) setae. Prealar setae 8 : 8 and 10 : 11, the posterior group longer than the anterior group. Scutellar setae 11, 11, all very long (116-120 microns). Wing without microtrichiae but thickly covered with conspicuous microtrichiae and appearing granular, bluish in color. Wing venation in Fig.10 c. Squama with 12 : 12, 18 : 18 fringe hairs. Anal lobe almost rectangularly produced. R2+3 ending at about midway between ends of R1 and R4+5, RR 0.44, 0.48. Costa extending beyond end of R4+5. fCu slightly beyond r-m, VR 1.09, 1.14. Cu2 slightly bent near apex (not strongly sinuate as in *Limnophyes* species). Anal vein extending much beyond fCu.

Front tibia with a long terminal spur (60  $\mu$ , Fig.10 e). Middle tibia with two short terminal spurs (46, 50  $\mu$ , Fig.10 f). Hind tibia with a long terminal spur (74  $\mu$ ), a short terminal spur (32  $\mu$ ), and a terminal comb composed of 15 free spines (32-52  $\mu$ , Figs.10 g, h).

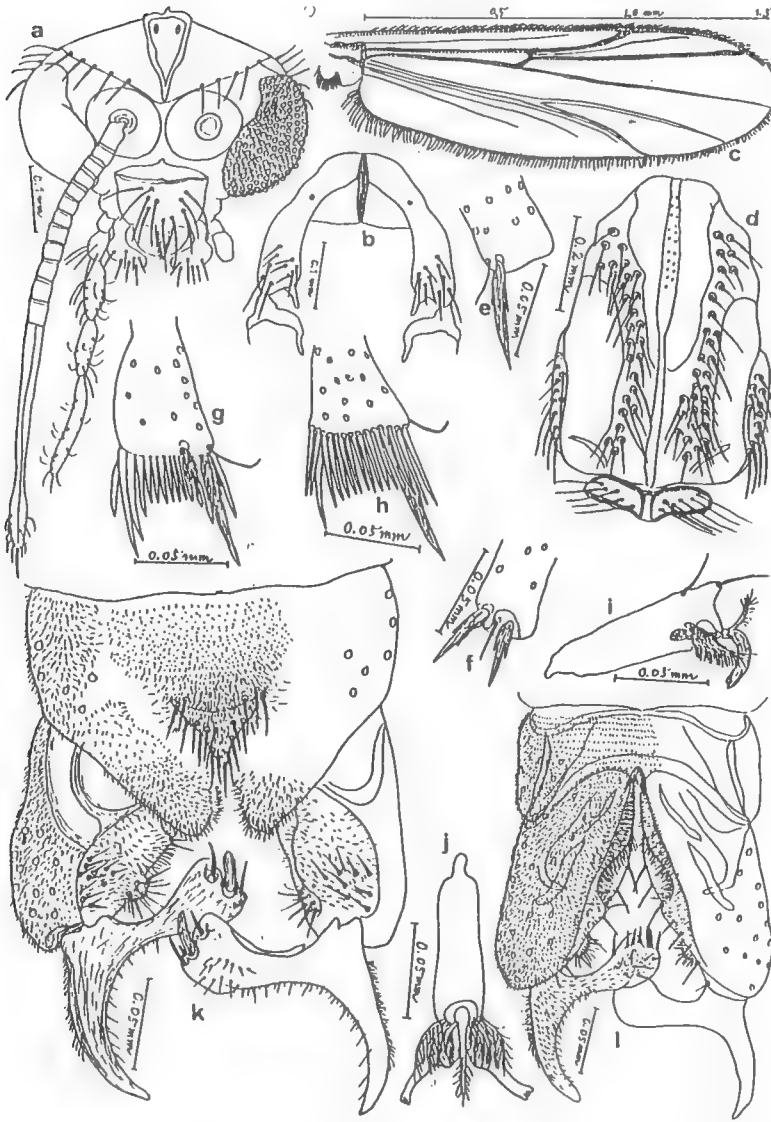
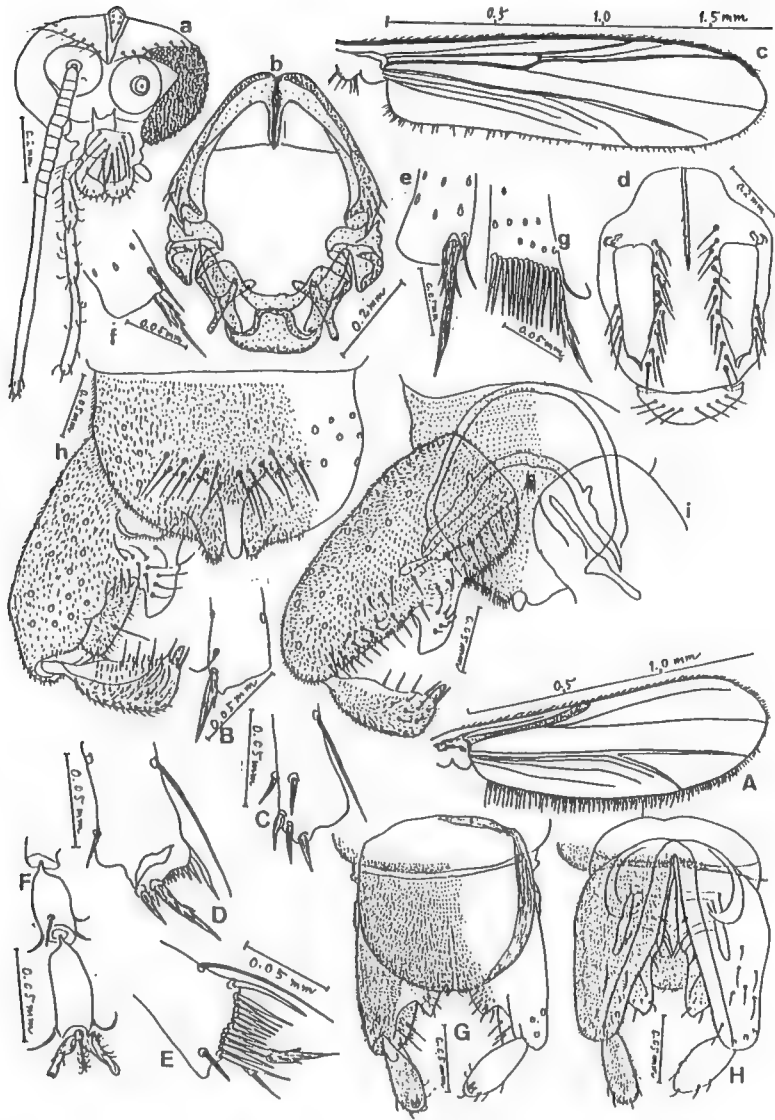


Fig.10. *Toyamayusurika shiotanii*, gen. nov., sp. nov., male. a : head. b : anteprenotum. c : wing. d : scutum and scutellum. e : tip of front tibia. f : tip of middle tibia. g, h : tip of hind tibia. i : front tarsus V, lateral view. j : middle tarsus V, ventral view. k : hypopygium, dorsal view. l : hypopygium, ventral view.





**Fig.11.** *Trissocladius itachigranulatus*, sp. nov., male. **a** : head. **b** : pronotum. **c** : wing. **d** : scutum and scutellum. **e** : tip of front tibia. **f** : tip of middle tibia. **g** : tip of hind tibia. **h** : hypopygium, dorsal view. **i** : hypopygium, ventral view.  
*Thienemanniella morosa* (EDWARDS). male. **A** : wing. **B** : tip of front tibia. **C** : tip of middle tibia. **D**, **E** : tip of hind tibia. **F** : front tarsi IV and V. **G** : hypopygium, dorsal view. **H** : hypopygium, ventral view.

Middle and hind tarsi I each with two short terminal spurs, middle tarsus II with two short terminal spurs, and hind tarsus II with one short terminal spur. fLR 0.51, 0.52, mLR 0.42, hLR 0.56, 0.57, fTR 0.13, 0.14, fBR 2.5, 2.7, mBR 2.7, hBR 3.3, 3.6. Front tarsus V with a conspicuous dorsoterminal process bearing a seta (Fig.10 i). All legs with a pair of fan-like pulvilli (Figs.10 i,j).

Hypopygium in Figs.10 k, l. Anal point roughly triangular and with pointed apex, darkly pigmented, and bearing some 20 strong, short setae. Gonocoxite with two low inner lobes, the distal and dorsal lobe small and with rounded margin, the ventral lobe long and broad, both bearing many short setae and microtrichiae. Gonostylus peculiar to this species, roughly V-shaped and with a long basal process directed backwards, and an inner process with truncate apex, which bears a large, darkly pigmented apical spur, and a subapical swelling, as in Figs.10 k, l.

*Remarks* : The name of this new species is dedicated to late Mr.Toshiyuki SHIOTANI, former mayor of Toyama City, in memory of his sympathy and encouragement of cultural and scientific activities in Toyama.

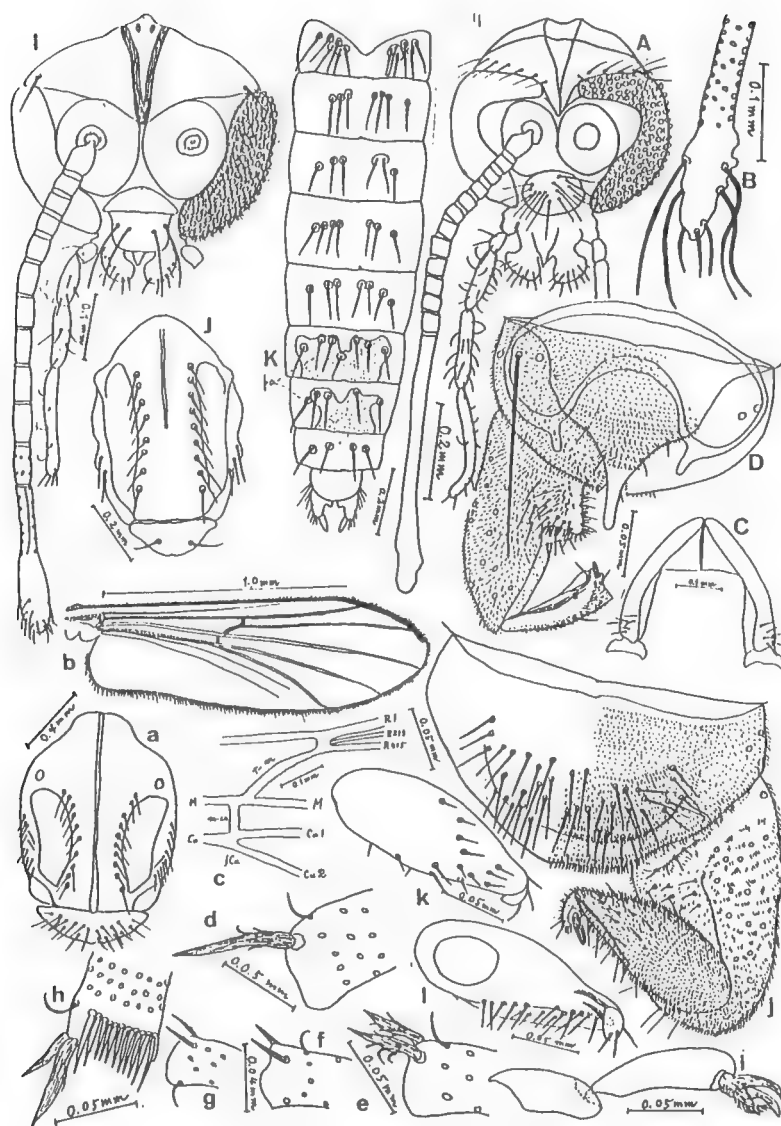
**48. *Trissocladius itachigranulatus*, sp. nov.**

(Figs. 11 a-i)

4 males were collected on the shore of the Itachigawa on 5 November 1985, each one at No.4 and 5, two at No.7. Holotype : A 111 : 01 ; paratypes : A 111 : 02-04.

*Mele* : Body length 2.86-3.72 (3.30 in average of 4) mm, wing length 1.84-2.14 (2.04) mm. Body almost entirely dark brown or black ; scutal stripes, scutellum and postnotum black, abdominal tergites and leg segments dark brown. Head in Fig.11 a. Eyes bare, each with a conspicuous dorsomedial projection, ER 0.68-0.91 (0.80). Antenna with 13 flagellar segments, AR 1.35-1.49 (1.42), AHR 0.61-0.63 (0.62). so 12-14 (12.7), cl 6 (in 2) or 8 (in 2). Anteprepronotum (Fig.11 b) well developed, united in the middle, without dorsal setae and with 2-4 (3.0) lateral setae on each side. Scutum and scutellum in Fig.11 d. Dorsomedian setae 8-10 (9.0), all minute, starting at some distance from anteprepronotum. Dorsolateral setae well developed, 15-28 (20.1), prealar setae 4-8 (5.5). Wing membrane without macrotrichiae and very finely granular. Squama with 5-8 (6.3) fringe hairs. Wing venation in Fig.11 c. RR 0.36-0.38 (0.37), VR 1.10-1.13 (1.12). Costa extending much beyond end of R4+5. Tip of Cu1 proximal to tip of R4+5. Cu2 almost straight. Anal vein extending beyond fCu. Anal lobe nearly rectangularly produced. Front tibia with a long terminal spur (80  $\mu$ , Fig.11 e). Middle tibia with two short spurs (26 and 57  $\mu$ , Fig.11 f). Hind tibia with a long terminal spur (70  $\mu$ ), a short terminal spur (24  $\mu$ ), and a terminal comb composed of 12 free spines (28-58  $\mu$  ; Fig.11 g). Middle and hind tarsi I and II each with one short terminal spur. Claws well developed, empodium reduced, pulvilli absent.

Abdominal tergites with numerous setae distributed almost on entire surface. Hypopygium in Figs.11 h, i. Anal point long, stout and apically rounded, with microtrichiae at the base but otherwise bare and almost transparent. Ninth tergite with 16-20 setae on



**Fig.12.** *Thienemanniella morosa* (EDWARDS). **male** (continued). **I** : head. **J** : scutum and scutellum. **K** : abdominal tergites.

*Parametriocemus stylatus* (KIEFFER), **male**. **A** : head. **B** : tip of antenna. **C** : anteprenotum. **D** : hypopygium, dorsal view.

*Psilodiamesa matunigra*, sp. nov., **male**. **a** : scutum and scutellum. **b** : wing. **c** : enlarged view of cross veins. **d** : tip of front tibia. **e** : tip of middle tibia. **f** : tip of middle tarsus I. **g** : tip of middle tarsus II. **h** : tip of hind tibia. **i** : front tarsi IV and V. **j** : hypopygium, dorsal view. **k** : gonostylus, dorsal view. **l** : gonostylus, ventral view.

both sides of anal point. Inner lobe of gonocoxite large, directed backwards, apically angulate and bearing short and strong setae. Gonostylus widest near apex and with convex lateral margin, bearing a strong apical spur but devoid of subapical swelling. Small virga present (Fig.11 i).

*Remarks* : The genus *Trissocladius* KIEFFER was reviewed in details by BRUNDIN (1956, p. 73), who recognized 8 species within this genus. The present species is tentatively classified in this genus, since eyes are bare and with a conspicuous dorsomedial projection, AR higher than 1, anteprenotum well developed, dorsomedian setae of scutum highly reduced in size, wing bare and with finely granular appearance, R4+5 ending distal to tip of Cu1, pulvilli absent, anal point is bare, and gonostylus is simple. Among the known species of this genus, this species is somewhat related to *T.mucronatus* BRUNDIN in that costa is extending much beyond end of R4+5, AR about 1.4, and the numbers of dorsolateral setae of scutum are 15-28, but it differs from all the known species of this genus in that anal point is robust and bare, and in the peculiar shape of inner lobe of gonocoxite and of gonostylus.

**49. *Thienemanniella morosa* (EDWARDS, 1924)**

(Figs. 11 A-H, 12 I-K)

Two males were collected at No.1 on 16 April 1986 (No. A 113 : 08C, 05A)

*Male* : Body length 2.05, 2.16 mm, wing length 1.42, 1.53 mm. Scutum, scutellum and postnotum almost entirely black, abdominal tergites (Fig.12 K) I to V entirely dark brown, VI and VII with a large pale area (pa) in the middle, leaving dark areas along oral and lateral margins, VIII dark brown, IX and hypopygium black, leg segments dark brown. Head in Fig.12 I. Eyes pubescent, widely apart from each other, ER 1.24, 1.44. Flagellar segments of antenna 12 in both specimens, AR 0.42, 0.53, last antennal segment swollen apically, with numerous short sensory setae in the apical portion. so 1 : 1, 1 : 1, cl 4, 4. Anteprenotum well developed, united in the middle, with numerous short sensory setae. Scutum and scutellum in Fig.12 J. Dorsomedian setae absent, dorsolaterals 6 : 6, 8 : 8, prealars 2 : 2, 2 : 3, scutellum with 2, 2 setae. Squama bare. Wing in Fig.11 A. Veins R and M as well as R1 and R4+5 fused to form a clavus, which extends to less than half of the wing length. VR 1.71, 1.77. Anal vein extending beyond fCu. A false vein commences at r-m and runs to near wing margin. Front tibia with a long terminal spur (30  $\mu$ , Fig.11 B). Middle tibia with three terminal spurs (16, 17, 20  $\mu$ ), and two subterminal spurs (13, 16  $\mu$  ; Fig.11 C). Hind tibia only slightly expanded apically, with a long terminal spur (40  $\mu$ ), a short terminal spur (17  $\mu$ ), and a terminal comb composed of 12 free spines 22-36  $\mu$  long (Figs.11 D, E). Tarsi I, II and III of middle and hind legs each with two short terminal spurs. Tarsi IV of all legs cordiform, and shorter than tarsi V of the same legs (Fig.11 F). Pulvilli absent.

Abdominal tergites (Fig.12 K) with long setae in a transverse row, 12, 12 in tergite I, 5, 6 or 7 in tergites II to VII, and 4, 4 in VIII. Hypopygium in Figs.11 g, H. Ninth tergite darkly pigmented and almost circular, without anal point and without long setae in the middle. Inner lobe of gonocoxite is nearly rectangular, and its posterior margin is concave.

Gonostylus simple, with a large, bifurcate apical spur.

*Remarks* : These specimens are morphologically typical to genus *Thienemanniella* KIEFFER, and provisionally identified as *T. morosa* (EDWARDS, 1924), because they accord in most of the key characters to the description of this species given by EDWARDS (1929, p.367) and PINDER (1978, p.98). However, these descriptions are rather incomplete, and it is also possible that the present specimens represent another, new species. Especially noteworthy are the shape and structure of ninth tergite, inner lobe of gonocoxite and antenna.

### C. Subfamily DIAMESINAE

#### 50. *Psilodiamesa matunigra*, sp. nov.

(Figs. 12 a-l)

A male was collected at A, on the shore of the Matsukawa, on 24 May 1983 (No. A 107 : 05).

*Male* : Body length 3.93 mm, wing length 2.24 mm. Eyes bare, without long dorsomedial projection, ER 0.90. Antenna with 13 flagellar segments, AR 1.62, AHR 0.66, last antennal segment 670  $\mu$  long, swollen apically, with a long terminal seta (42  $\mu$ ) and numerous short sensory setae in the apical region. Antepnotum with 8 lateral setae. Scutum and scutellum in Fig.12 a. Dorsomedian setae absent, dorsolateral setae 10 : 11, all arising from a large pale pit, prealar setae 11 : 10, scutellar setae 20 in double rows. Wing in Fig.12 b. Squama with 42 fringe hairs. Wing membrane bare, smooth, brownish in transmitted light. Anal lobe strongly produced. Costa extending much beyond end of R4+5. R2+3 ending closer to end of R1 than to end of R4+5, RR 0.40. The interrelationship between the cross veins r-m and m-cu, and the forks fR and fCu as in Fig.12 c. r-m situated slightly distal to fCu, VR 0.97 m-cu connected with Cu just at fCu. End of Cul much proximal to end of R4+5. Anal vein extending much beyond fCu. The structure of tibial ends are similar to that of most species of Orthocladinae. Front tibial with a long terminal spur (82  $\mu$ , Fig.12 d). Middle tibia with two terminal spurs (50, 52  $\mu$ , Fig.12 e). Hind tibia with a long terminal spur (60  $\mu$ ), a slightly shorter terminal spur (56  $\mu$ ), and a terminal comb composed of 10 free spurs (22-48  $\mu$ , Fig.12 h). Tarsi I and II of middle and hind legs with two short terminal spurs (Figs.12 f, g), other tarsal segments without terminal spur. Tarsi IV of all legs cordiform and shorter than tarsi V of the same legs (Fig.12 i). Pulvilli absent, claws and empodium well developed (Fig.12 i).

Hypopygium in Fig.12 j. Ninth tergite broad and rounded, without anal point and with 40 long setae. Gonocoxite apparently without inner lobe, macrotrichiae rather sparse. Gonostylus (Figs.12 k, l) widest at about basal 1/3 and tapering towards apex, acutely bent outwards near apex, and with a large dark terminal spur (23  $\mu$  long and 6  $\mu$  wide).

*Remarks* : This species is provisionally placed into the genus *Psilodiamesa* KIEFFER, 1918, in the sense of TOKUNAGA (1936, p.526) and GOETGHEBUER (1939, p.16), since cross vein m-cu is not proximal to fCu, tarsi IV of all legs are cordiform and shorter than tarsi V of the same legs, dorsolateral setae of scutum well developed and arising from large pale pits, front tibia is longer than front tarsus I, and eyes are bare. The above authors regarded *Psilodiamesa*

as a subgenus of genus *Diamesa*, and the latter listed 21 species or subspecies from Europe, while the former described a species, *Diamesa (Psilodiamesa) nigatana* from Japan. In the present species, m-cu is connected with the vein Cu just at fCu, while such a structure is attributed to the key character of genus *Heptagyia* Philippi by GOETGHEBUER (1939, p.2), and all members of *Diamasa* and *Psilodiamesa* were differentiated from it in that m-cu is distal to fCu and connected with Cul. The present species is also somewhat similar in the structure of male hypopygium and body coloration to *P. nigatana* (TOKUNAGA), but the latter differs essentially from the present species in that gonostylus is not sharply bent apically, setae on gonostylus are forked (simple in the present species), apical spine minute, and ninth tergite without strong setae such as seen in the present species; furthermore, the body is about 6 mm long and much larger, AR 3.35 and much larger, tarsi IV longer than tarsi V (the relation is reversed in the present species), and front tarsi I and II with apical spurs (these are absent in the present species) in *P. nigatana*.

#### 51. *Syndiamesa takatensis* TOKUNAGA, 1936

A male was collected at No.8 on 16 April 1986 (No. A 116: 51A).

*Remarks* : This is a species described by TOKUNAGA (1936, p.531) based on a single male specimen collected on snow in spring at Takata (Niigata). Large numbers of the adults were found by us also on snow and on walls of various localities in Toyama City from the beginning to the end of March every year, and the morphology of male and female was described by SASA & KAWAI (1985, p.7).

### SUMMARY

The collections of the adult chironomids swarming or resting on the bank as well as the larval chironomids from waterweeds and bottom samples were conducted several times during the period from May 1983 to July 1986, by setting 10 collection sites (No.1 to 10) along the main stream of Itachigawa, and 7 sites (A to G) along its tributary, the Matsukawa. As the results, a total of 51 chironomids species were collected and identified, as shown in Table 1. Among these species, we consider at the present stage, 10 are new species, and another 4 as new records to Japan. Some of the other species collected in the present surveys were already recorded from Japan but were only poorly known on their morphology, distribution or ecology, and valuable information to these species have been added as the result of this study.

The Itachigawa and its tributary, the Matsukawa, are rather small streams running more or less rapidly through the agricultural fields in the upper portions, and through the urban areas of Toyama City, receiving much of the sewage waters in the lower reaches, and small to medium degrees of pollution with fertilizers and sewage waters were observed. The chironomid species observed in the present surveys seemed also to reflect from low to medium degrees of pollution. The chironomid fauna of this small river were, however, much

more complicated than we expected, and it was very surprising that as many as 51 species were collected, and they included 10 new and 4 unrecorded species, adding much information to the Japanese chironomid fauna.

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